Distr.
LIMITED
UNIDO/IS.403

UNITED NATIONS
INDUSTRIAL DEVEOPMENT ORGANIZATION

23 August 1983
ENGLISH

# WOOD PROCESSING INDUSTRY IN A "TIMBER DEFICIT" COUNTRY, JAPAN: STRUCTURAL CHANGE, ADJUSTMENT PROBLEMS AND POLICIES

Prepared by

Regional and Country Studies Branch

Division for Industrial Studies

UNIDO WORKING PAPER ON STRUCTURAL CHANGES

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# PREFACE

This study was undertaken within the framework of UNIDO's research programme on industrial redeployment and structural adjustment. It constitutes a part of a series of country studies designed to analyse past changes in the industrial structure of individual developed countries and to examine current problems and likely future developments.

It is believed that by initiating and carrying out these country studies and ensuring a broad dissemination thereof UNIDO may contriubute to reducing uncertainties and highlighting pertinent trends of development prospects and the adjustment process, thereby creating a basis for an adjustment policy that would be anticipatory in nature. The findings and conclusions would seem to be of direct relevance for the international debate on the future restructuring of world industry and trade and for the conception of suitable policies and forms of industrial co-operation between the developed and the developing countries. In this context a review of the development pattern of developed countries is attempted in the light of the changing international division of labour and in particular of the industrialization prospects and priorities of developing countries. To this end a close dialogue with the various parties in the restructuring process is believed to be useful.

As part of its research programme on redeployment and structural adjustment, UNIDO's Division for Industrial Studies has endeavoured to examine the wood processing industry in the Asian and Pacific Region. Many developing countries in Asia and the Pacific are richly endowed with forest resources which constitute a potential, important element in strategies for promoting resource-based industrial development. These countries possess dynamic comparative advantages for development of their wood and wood products industries. A growing desire is now emerging among the wood exporting

developing countries of the need for increasing the degree of local processing of this important raw material. The development of wood and wood poducts industries is therefore becoming an increasingly important aspect of industrial policy and strategy. Various constraints however inhibit the process of wood based industry development, such as: i) lack of domestic financial resources for the expansion of processing facilities, ii) problems related to transport and to industrial policies and market access in developed market economies and iii) lack of technology and know-how, which are of decisive importance in this respect.

Japan is a major importer of unprocessed wood from Asian developing countries and has a sizeable wood industry serving domestic and export markets. Redeployment possibilities of wood processing capacities from Japan is an important potential avenue of industrial growth for the wood-exporting developing countries of the region. The question arises to what extent the process of structural change in industry in Japan and industrial strategies and policies concerning the future of its trade and production in timber and wood products might be divergent or convergent with the aspirations of wood exporting developing countries in the region in terms of increasing the degree of local processing of wood and wood poducts.

It is important for developing countries of Asia and the Pacific to become aware of current and future redeployment opportunities of wood and wood poducts from Japan and other developed countries. In this regard it is essential to determine to what extent exisiting constraints inhibiting the redeployment process can be overcome by appropriate industrial policies and strategies in the developing and developed countries concerned. There is thus an urgent need to examine to what extent convergence or divergence of interest may emerge which could be subject to bilateral and multilateral agreements within the framework of international and regional industrial co-operation.

With a view to examining these issues UNIDO's Division for Industrial Studies has carried out two closely interrelated studies. The first study, which is contained in this document, focusses on structural change, adjustment problems and policies related to the wood processing industry in Japan. The study was prepared by Kiichiro Fukasaku[1/] of the University of Sussex, as UNIDO consultant in co-operation with the Regional and Country Studies Branch. The second study was prepared simultanously and in close co-ordination with the present study and deals with "Potentials and Requirements of Increasing the Degree of Wood Processing in Developing Countries of Asia and the Pacific" (UNIDO/IS. 395, 30 June 1983). It was prepared by Horatio Brion as UNIDO consultant in co-operation with the Sectoral Studies Branch. In view of the close interrelationship between the two studies, a summary of the main conclusions and findings are being synthetized in a separate document entitled: "Prospects and Opportunitites in the Wood Processing Sector in the Asian and the Pacific Region"

1/ The views expressed in this study are those of the consultant and do not necessarily reflect the views of the Secreatariat of UNIDO or of the governments of any of the countries mentioned in the study.

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## 1. Introduction

Japan is a "timber deficit" country which has a sizeable wood industry serving both domestic and export markets. It is a major importer of unprocessed wood of the so called "South Sea"[1/] logs from "timber surplus" developing countries of Asia and the Pacific.

The aims of this paper are: to analyze the structure of Japan's wood industry in terms of production, supply constraints, imports, exports and distribution system; to examine adjustment problems and relevant industrial policies and government adjuistment assistance determining the process of structural change in production and trade pattern; and further to outline various methods of strengtherning industrial co-operation between Japan and "timber surplus" countries of Asia and the Pacific.

The paper is divided into nine chapters. Following the Introduction, chapter 2 surveys the structure of the wood processing industry in Japan. In chapter 3 supply constraints on unprocessed logs are examined both in terms of domestic supply and imports as well as the potential for substitution in sources of supply of logs and substitution in regard to non-wood products. A review of the structural changes which have occurred in the wood processing industry by subbranches is presented in chapter 4 followed by analyses of the domestic distribution system and marketing problems in chapter 5. The structure of international trade in wood and wood products and related trade policies, trade barriers, prices and shipping costs are discussed in chapter 6. Adjustment problems and adjustment asssistance measures are then reviewed in the following chapter 7. In chapter 8 various aspects of international

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1/ "South Sea" logs are defined as imported timber from seven countries and regions, i.e. the Philippines, Indonesia, Malaysia, Papua New Guinea, Singapore, the Solomon Islands and Brunei, except for paulownia (kiri), teak, and liqnum vitae.

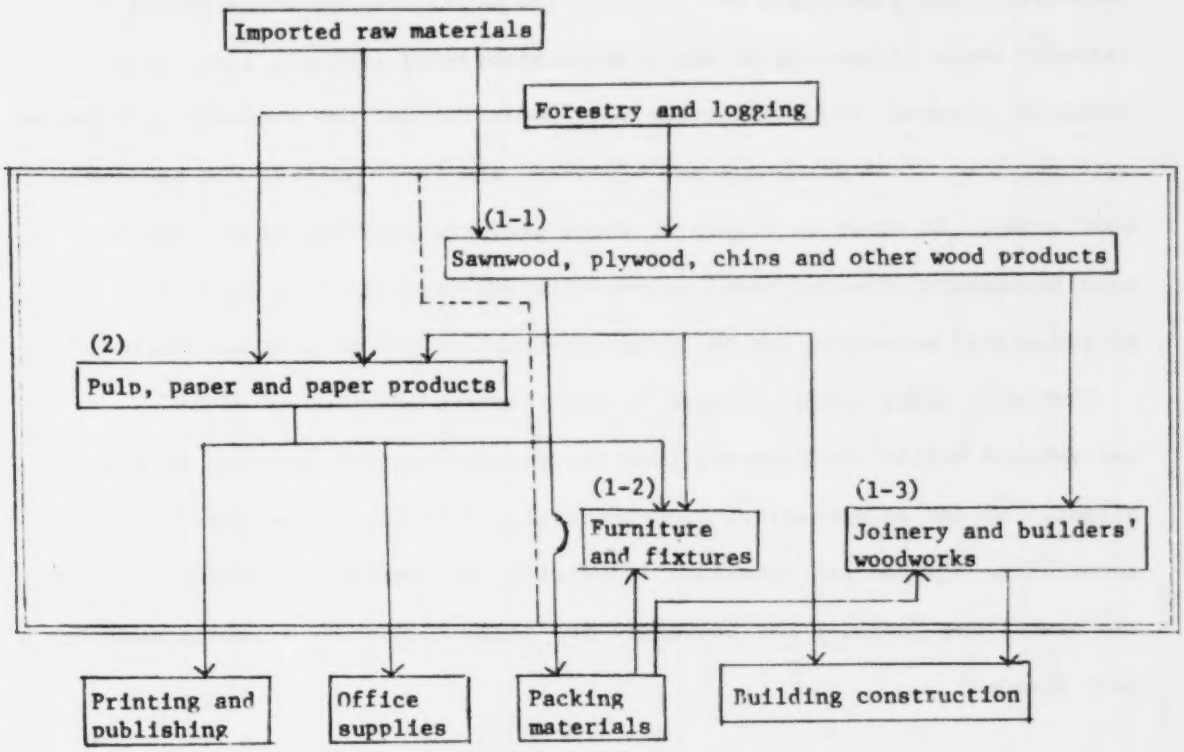
co-operation between Japan and "timber surplus" countries are examined with selected case studies of direct foreign investment/joint-ventures; international subconstracting and technical co-operation. The final chapter 9 contains conclusions and policy recommendations.

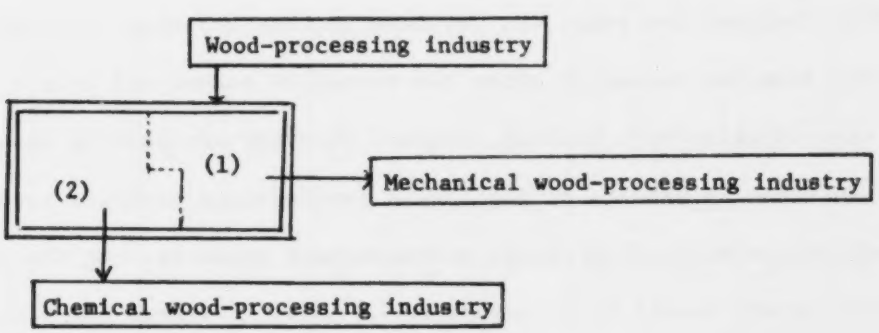
## 2. Characteristics of Wood-processing Industry in Japan

### 2.1. Structure

The relative position of the wood-processing industry as against total manufacturing indstry is shown in Table 1. The wood-processing industry accounted for only 8.6% of number of workers, 6.8% of gross output and 6.4% value added of total manufacturing industry in 1980. These shares have been on the slight decrease over the last decade. The Japanese manufacturing industry has rapidly moved toward the so-called heavy and petro-chemical industries represented by iron and steel industry, petroleum refinery and chemical industries, general and electric machinery industries, and automobile industry since the mid 1960s. The export structure of manufactured products has also shifted toward more capital-intensive products and then, more technology-oriented products like high-quality electric appliances, electronics products, numerically-controlled machine tools in the 1970s. Therefore, the relative importance of the wood-processing industry in Japan has been decreasing in terms of number of workers, gross output and value added in the 1960s and 70s. However, the wood-processing industry has made a substantial contribution to improve the standard of living in Japan by supplying better quality industrial materials to the sectors such as housing construction, furniture and others.

Figure 1. Input-output Structure of Wood-processing Industry in Japan



The input-output structure of the wood-processing industry in Japan is illustrated by Figure 1. The wood-processing industry consists of (1) the mechanical wood-processing industry and (2) chemical wood-processing industry. This paper will focus on (i) the mechanical wood-processing industry which is made up of the primary processing sectors, i.e. (1-1) sawnwood, plywood, chips and other wood products, and the secondary processing sectors, i.e. (1-2) furniture and fixtures, and (1-3) joinery and builder's wood works. As shown in Figure 1, those products supplied by mechanical wood-processing industry based on domestic and imported logs are mainly used as industrial materials for building construction and packing materials.

Table 2 shows recent changes in the relative position of major sub-sectors within the Japanese wood-processing industry in terms of gross output. As far as mechanical wood-processing industry is concerned, the sawmilling, plywood and furniture industries are dominant in Japan, although the sawmilling industry has decreased its production share slightly over the last decade.

## 2.2. Current Situation

Over the past two years the Japanese economy has been in a process of recovery from the recession after the so-called second oil crisis 1979-80, but in a very sluggish way, because economic recovery was heavily dependent on a rapid increase in exports of particular manufactured products such as automobiles, electronic products and machinery products. On the other hand, economic growth caused by an expansion of domestic demand has been very limited due to: i) stagnation of private consumption expenditure brought about by a low increase in real personal disposable income, ii) depression of

Table 1. Changes in the relative position of the wood-processing industry in Japan (1971-80)

| | Number of workers (Thousand, %) | | | | Gross output (Billion of Yen, %) | | | | Value added (Billion of Yen, %) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Manufacturing total | Wood and wood products | Furniture and fixtures* | Pulp and paper products | Manufacturing total | Wood and wood products | Furniture and fixtures* | Pulp and paper products | Manufacturing total | Wood and wood products | Furniture and fixtures* | Pulp and paper products |
| 1971 | 11463 | 513 | 267 | 334 | 72895 | 2257 | 863 | 2392 | 25734 | 689 | 352 | 784 |
| | 100.0 | 4.4 | 2.3 | 2.9 | 100.0 | 3.0 | 1.1 | 3.2 | 100.0 | 2.6 | 1.3 | 3.0 |
| 1972 | 11783 | 512 | 282 | 332 | 80961 | 2631 | 1018 | 2622 | 29191 | 859 | 425 | 848 |
| | 100.0 | 4.3 | 2.3 | 2.8 | 100.0 | 3.2 | 1.2 | 3.2 | 100.0 | 2.9 | 1.4 | 2.9 |
| 1973 | 11961 | 509 | 284 | 333 | 103362 | 3776 | 1342 | 3486 | 37935 | 1273 | 545 | 1163 |
| | 100.0 | 4.2 | 2.3 | 2.7 | 100.0 | 3.6 | 1.2 | 3.3 | 100.0 | 3.3 | 1.4 | 3.0 |
| 1974 | 11486 | 485 | 278 | 329 | 127308 | 3986 | 1600 | 4772 | 44794 | 1196 | 656 | 1650 |
| | 100.0 | 4.2 | 2.4 | 2.8 | 100.0 | 3.1 | 1.2 | 3.7 | 100.0 | 2.6 | 1.4 | 3.6 |
| 1975 | 11296 | 465 | 287 | 319 | 127432 | 3618 | 1669 | 4210 | 42345 | 1090 | 702 | 1293 |
| | 100.0 | 4.1 | 2.5 | 2.8 | 100.0 | 2.8 | 1.3 | 3.3 | 100.0 | 2.5 | 1.6 | 3.0 |
| 1976 | 11173 | 446 | 282 | 313 | 145359 | 4066 | 1823 | 4634 | 48933 | 1233 | 764 | 1444 |
| | 100.0 | 3.9 | 2.5 | 2.8 | 100.0 | 2.7 | 1.2 | 3.1 | 100.0 | 2.5 | 1.5 | 2.9 |
| 1977 | 10874 | 422 | 273 | 303 | 156917 | 4206 | 1934 | 5051 | 52460 | 1306 | 819 | 1540 |
| | 100.0 | 3.8 | 2.5 | 2.7 | 100.0 | 2.6 | 1.2 | 3.2 | 100.0 | 2.4 | 1.5 | 2.9 |
| 1978 | 10890 | 414 | 279 | 299 | 164810 | 4272 | 2083 | 5041 | 57162 | 1420 | 910 | 1615 |
| | 100.0 | 3.8 | 2.5 | 2.7 | 100.0 | 2.5 | 1.2 | 3.0 | 100.0 | 2.4 | 1.5 | 2.8 |
| 1979 | 10859 | 405 | 279 | 297 | 184257 | 5051 | 2384 | 5615 | 64796 | 1634 | 1029 | 1759 |
| | 100.0 | 3.7 | 2.5 | 2.7 | 100.0 | 2.7 | 1.2 | 3.0 | 100.0 | 2.5 | 1.5 | 2.7 |
| 1980 | 10932 | 392 | 275 | 291 | 214699 | 5454 | 2581 | 6799 | 71247 | 1643 | 1087 | 1910 |
| | 100.0 | 3.5 | 2.5 | 2.6 | 100.0 | 2.5 | 1.2 | 3.1 | 100.0 | 2.3 | 1.5 | 2.6 |

* Including only wooden furniture and fixtures, and joinery products.

Source: MITI, Manufacturing Census 1982.

housing construction, and iii)sluggishness of private business investment especially on the part of small- and medium-scale enterprises.

The Japanese wood-processing industry has been adversely affected by a current depression of housing construction. Table 3 shows a recent trend in the number of housing starts by fund and structure. Total housing starts by private funds have been decreasing rapidly in recent years. This trend can be explained by:

(i) A sharp increase in the prices of land and construction materials 1979-80,

(ii) A rapid increase in the consumer's price, leading to stagnation of real personal income, and

(iii)An anti-inflationary, tight monetary policy, which raised the mortgage rate.

As also shown in Table 3, the ratio of wooden houses in total housing construction has been decreasing steadily during the 1970s. Although the floor area per unit increased, this may be cancelled by the decreasing share of the wooden houses.

Total demand for wood and wood products in Japan is heavily influenced by the market condition of housing construction which is to a fairly large extent affected by fiscal and monetary policies of the government.[1/] Reflecting the prolonged depression of the housing market, the Japanese wood-processing industry has also remained in a state of severe depression due to a sharp fall in the demand for wood products, especially since the middle of 1980.

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1/ For a quantitative analysis of this subject, for example, see Toshida, M. (1981), "Repercussion Effects of Economic Policy on Demand for Lumber and Plywood", in IUFRO (ed.) (1981), The Current State of Japanese Forestry - its Problems and Future, Kyoto, Japan.

Table 2. Changes in relative position within the wood-processing industry in Japan in terms of gross output

(Billion of Yen/Percentage)

| Year | WOOD AND WOOD PRODUCTS | | | | | | | | | FURNITURE AND FIXTURES | | | | PULP, PAPER AND PAPER PRODUCTS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Sawn-wood | Veneer | Chips | Ply-wood | Wood products for construction | Particle board | Wooden foot-wear | Other wood products | Total | Furni-* ture and fixtures | Joinery products | Others | Total | Pulp | Paper excluding paper-board | Paper-board | Con-verted paper | Paper products | Fibre-board | Others |
| 1971 | 2257 | 1165 | 15 | 80 | 487 | 46 | 6 | 6 | 452 | 863 | 524 | 188 | 151 | 2392 | 103 | 677 | 310 | 209 | 160 | 26 | 907 |
| | 100.0 | 51.6 | 0.7 | 3.5 | 21.6 | 2.0 | 0.3 | 0.3 | 20.0 | 100.0 | 60.7 | 21.8 | 17.5 | 100.0 | 4.3 | 28.3 | 13.0 | 8.7 | 6.7 | 1.1 | 37.9 |
| 1972 | 2631 | 1362 | 25 | 87 | 545 | 87 | 7 | 6 | 512 | 1018 | 629 | 213 | 176 | 2622 | 107 | 724 | 329 | 254 | 167 | 30 | 1011 |
| | 100.0 | 51.8 | 1.0 | 3.3 | 20.7 | 3.3 | 0.3 | 0.2 | 19.4 | 100.0 | 61.8 | 20.9 | 17.3 | 100.0 | 4.1 | 27.6 | 12.5 | 9.7 | 6.4 | 1.1 | 38.6 |
| 1973 | 3776 | 1918 | 35 | 89 | 879 | 146 | 10 | 7 | 692 | 1342 | 839 | 274 | 229 | 3486 | 117 | 914 | 499 | 352 | 206 | 38 | 1360 |
| | 100.0 | 50.8 | 0.9 | 2.4 | 23.3 | 3.9 | 0.3 | 0.2 | 18.2 | 100.0 | 62.5 | 20.4 | 17.1 | 100.0 | 3.4 | 26.2 | 14.3 | 10.1 | 5.9 | 1.1 | 39.0 |
| 1974 | 3986 | 1970 | 48 | 147 | 862 | 161 | 12 | 8 | 778 | 1600 | 1028 | 315 | 257 | 4772 | 111 | 1392 | 618 | 461 | 274 | 42 | 1874 |
| | 100.0 | 49.4 | 1.2 | 3.7 | 21.6 | 4.0 | 0.3 | 0.2 | 19.5 | 100.0 | 64.3 | 19.7 | 16.0 | 100.0 | 2.3 | 29.2 | 13.0 | 9.7 | 5.7 | 0.9 | 39.2 |
| 1975 | 3618 | 1867 | 44 | 140 | 704 | 143 | 12 | 7 | 701 | 1669 | 1044 | 342 | 283 | 4210 | 99 | 1342 | 445 | 377 | 270 | 32 | 1645 |
| | 100.0 | 51.6 | 1.2 | 3.9 | 19.5 | 4.0 | 0.3 | 0.2 | 19.3 | 100.0 | 62.6 | 20.5 | 16.9 | 100.0 | 2.4 | 31.9 | 10.6 | 9.0 | 6.4 | 0.7 | 39.0 |
| 1976 | 4066 | 2065 | 50 | 141 | 887 | 151 | 18 | 8 | 746 | 1823 | 1139 | 368 | 316 | 4634 | 105 | 1493 | 530 | 413 | 286 | 41 | 1766 |
| | 100.0 | 50.8 | 1.2 | 3.5 | 21.8 | 3.7 | 0.4 | 0.2 | 18.3 | 100.0 | 62.5 | 20.2 | 17.3 | 100.0 | 2.3 | 32.2 | 11.4 | 8.9 | 6.2 | 0.9 | 38.1 |
| 1977 | 4206 | 2105 | 47 | 141 | 898 | 201 | 22 | 8 | 784 | 1934 | 1197 | 388 | 349 | 5051 | 97 | 1569 | 607 | 512 | 299 | 42 | 1925 |
| | 100.0 | 50.0 | 1.1 | 3.4 | 21.4 | 4.8 | 0.5 | 0.2 | 18.6 | 100.0 | 61.9 | 20.1 | 18.0 | 100.0 | 1.9 | 31.1 | 12.0 | 10.1 | 5.9 | 0.8 | 38.1 |
| 1978 | 4272 | 2149 | 60 | 133 | 876 | 208 | 24 | 7 | 815 | 2083 | 1266 | 434 | 383 | 5041 | 87 | 1520 | 556 | 551 | 324 | 40 | 1963 |
| | 100.0 | 50.3 | 1.4 | 3.1 | 20.5 | 4.9 | 0.6 | 0.2 | 19.0 | 100.0 | 60.8 | 20.8 | 18.4 | 100.0 | 1.7 | 30.2 | 11.0 | 10.9 | 6.4 | 0.8 | 38.9 |
| 1979 | 5051 | 2507 | 66 | 134 | 1165 | 222 | 30 | 6 | 921 | 2384 | 1473 | 472 | 439 | 5615 | 115 | 1611 | 684 | 686 | 320 | 43 | 2156 |
| | 100.0 | 49.6 | 1.3 | 2.7 | 23.1 | 4.4 | 0.6 | 0.1 | 18.2 | 100.0 | 61.8 | 19.8 | 18.4 | 100.0 | 2.0 | 28.7 | 12.2 | 12.2 | 5.7 | 0.8 | 38.4 |
| 1980 | 5454 | 2663 | 63 | 188 | 1258 | 237 | 38 | 7 | 1000 | 2581 | 1619 | 508 | 454 | 6799 | 137 | 1933 | 939 | 803 | 361 | 48 | 2578 |
| | 100.0 | 48.8 | 1.2 | 3.4 | 23.1 | 4.3 | 0.7 | 0.1 | 18.3 | 100.0 | 62.7 | 19.7 | 17.6 | 100.0 | 2.0 | 28.4 | 13.8 | 11.8 | 5.3 | 0.7 | 37.9 |

* Including only wooden furniture and fixtures.

Source: See Table 1.

Table 3. Housing starts in Japan (1970-81)

| | Housing Starts (thousand units) | | | | | Housing Starts (thousand units) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | By fund | | By structure | | | By fund | | By structure | |
| Year | Total | Private | Public | Wooden | Non-wooden | Total | Private | Public | Wooden | Non-wooden |
| 1970 | 1484 | 1122 | 363 | 1035 | 449 | 100.0 | 75.6 | 22.4 | 69.7 | 30.3 |
| 1971 | 1463 | 1055 | 407 | 967 | 496 | 100.0 | 72.1 | 27.8 | 66.1 | 33.9 |
| 1972 | 1807 | 1356 | 450 | 1111 | 695 | 100.0 | 75.0 | 24.9 | 61.5 | 38.5 |
| 1973 | 1905 | 1499 | 405 | 1120 | 784 | 100.0 | 78.7 | 21.2 | 58.8 | 41.1 |
| 1974 | 1316 | 918 | 397 | 869 | 446 | 100.0 | 69.8 | 30.2 | 66.0 | 33.9 |
| 1975 | 1356 | 948 | 407 | 907 | 448 | 100.0 | 69.9 | 30.0 | 66.9 | 33.0 |
| 1976 | 1523 | 1127 | 396 | 992 | 530 | 100.0 | 74.0 | 26.0 | 65.1 | 34.8 |
| 1977 | 1508 | 1078 | 429 | 946 | 561 | 100.0 | 71.5 | 28.4 | 62.7 | 37.2 |
| 1978 | 1549 | 948 | 600 | 958 | 591 | 100.0 | 61.2 | 38.7 | 61.8 | 38.2 |
| 1979 | 1493 | 885 | 607 | 909 | 583 | 100.0 | 59.3 | 40.7 | 60.9 | 39.0 |
| 1980 | 1268 | 724 | 544 | 750 | 517 | 100.0 | 57.1 | 42.9 | 59.1 | 40.8 |
| 1981 | 1151 | 614 | 537 | 653 | 498 | 100.0 | 53.3 | 46.7 | 56.7 | 43.3 |

Source: Ministry of Construction, Annual Report of Housing Starts, 1982.

The trend in timber demand and supply of Japan in 1960-82 is given in Table 4. Total valume of timber demand in 1980, converted into equivalent round wood requirements, was 108.9 million $m^3$ and estimated to drop to the level of 94.3 million $m^3$ in 1981. The timber demand for sawmilling decreased sharply compared with that for plywood and pulp. For 1982, however, total timber demand is projected to increase slightly up to 95.0 million $m^3$.

In 1980, the shares of timber demand by end use were 52% for sawmilling, 12% for plywood, 33% for pulp and 3% for other uses. During the last decade the share of timber requirements for sawmilling dropped by 8%, the share of pulp rose by the same amount, while that for plywood remained almost unchanged.

Turning to the supply side of timber, Japan rapidly increased its dependence on imported timber to meet a steady expansion of domestic demand in the 1960s and up to 1973. Because the supply of domestic timber was on the decrease after 1967. In that year domestic timber supply recorded a peak level of 52.7 million $m^3$ (including 0.9 million $m^3$ of logging residues). In 1975-80 the supply of domestic timber stayed at the level of 32-35 million $m^3$, and the volume of imported timber fluctuated between 62 - 76 million $m^3$ with an upward trend. As a result of these developments, the import share rose gradually from 13% in 1960 to nearly 70% in 1979.

In 1980-81, total timber supply again dropped sharply by 13.4% i.e. by 7.0% for domestic timber and by 16.4% for imported timber respectively; this reflects the fact that timber suppliers tried to make an inventory adjustment to meet a substantial reduction in timber demand. Although the supply of domestic and imported timber was reduced at the same time, the share of imported timber declined to 66%, because the decrease in imported timber was much larger than that in domestic timber.

Table 4. Timber demand and supply in Japan (1960-82)

(Thousand $m^3$/Percentage)

| Year | DEMAND | | | | | SUPPLY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Domestic timber | | | | Imported timber** | | | | | | | |
| | Total | Sawn-wood | Ply-wood | Pulp | Others | (A) Total | Sub total | Round wood | Logging residues | Mill* resi-dues | (B) Sub total | Logs | Sawn timber | Ply-wood veneer | Chips | Pulp | Others | Import share Percentage B/A |
| 1960 | 56547 | 37789 | 3178 | 10189 | 5391 | 56547 | 49006 | 48515 | 491 | (1543) | 7541 | 6674 | 211 | - | - | 656 | - | 13.3 |
| 1965 | 70530 | 47084 | 5187 | 14335 | 3924 | 70530 | 50375 | 49534 | 841 | (4307) | 20155 | 16721 | 1115 | 2 | 270 | 2036 | 11 | 28.6 |
| 1970 | 102679 | 62009 | 13059 | 24887 | 2724 | 102679 | 46241 | 45351 | 890 | (6737) | 56438 | 43281 | 3957 | 548 | 5031 | 3509 | 112 | 55.0 |
| 1971 | 101405 | 59801 | 13362 | 25715 | 2527 | 101405 | 45966 | 45253 | 713 | (7299) | 55439 | 43909 | 2792 | 200 | 5946 | 2472 | 120 | 54.7 |
| 1972 | 106504 | 63613 | 14309 | 26202 | 2380 | 106504 | 43941 | 43114 | 827 | (7371) | 62563 | 47697 | 3222 | 380 | 8076 | 2962 | 226 | 58.7 |
| 1973 | 117580 | 67470 | 17151 | 30414 | 2545 | 117580 | 42208 | 41583 | 625 | (7797) | 75372 | 52485 | 4666 | 1600 | 12094 | 4061 | 466 | 64.1 |
| 1974 | 113040 | 60734 | 14481 | 34957 | 2868 | 113040 | 39474 | 38874 | 600 | (7653) | 73566 | 48453 | 4287 | 882 | 13580 | 5440 | 924 | 65.1 |
| 1975 | 96369 | 55341 | 11173 | 27298 | 2557 | 96369 | 34577 | 34155 | 422 | (6448) | 61792 | 42681 | 2964 | 335 | 11340 | 3688 | 784 | 64.1 |
| 1976 | 102609 | 57394 | 12939 | 29639 | 2637 | 102609 | 35760 | 35271 | 489 | (7281) | 66849 | 45118 | 3821 | 207 | 13025 | 3798 | 880 | 65.1 |
| 1977 | 101854 | 56564 | 12717 | 29841 | 2732 | 101854 | 34231 | 33793 | 438 | (7251) | 67623 | 44561 | 4125 | 118 | 13820 | 4002 | 997 | 66.4 |
| 1978 | 103417 | 57560 | 13585 | 29597 | 2675 | 103417 | 32558 | 32145 | 413 | (7282) | 70859 | 46158 | 4467 | 138 | 13116 | 5954 | 1026 | 68.5 |
| 1979 | 109786 | 60314 | 13915 | 32137 | 3420 | 109786 | 33784 | 33270 | 514 | (7721) | 76002 | 46950 | 5656 | 172 | 15003 | 6413 | 1808 | 69.2 |
| 1980 | 108964 | 56713 | 12840 | 35868 | 3543 | 108964 | 34557 | 34051 | 506 | (7275) | 74407 | 42395 | 5136 | 199 | 15936 | 7670 | 2071 | 68.3 |
| 1981[a/] | 94370 | 51030 | 11180 | 29130 | 3030 | 94370 | 32130 | 31670 | 460 | (6640) | 62240 | 37970 | 4160 | 120 | 12510 | 5860 | 1620 | 66.0 |
| 1982[b/] | 95050 | 51450 | 11000 | 29550 | 3050 | 95050 | 32450 | 32000 | 450 | (6700) | 62600 | 37850 | 4400 | 150 | 12350 | 6150 | 1700 | 65.9 |

* Figures in parenthesis are for chips (and others for 1960 and 1965) made from mill-residues.
** Volume converted into round wood basis.
a/ Estimate.
b/ Prospect.

Source: M.A.F.F., Report on Demand and Supply of Lumber.

According to Trade Statistics (customs clearance basis) published by Ministry of Finance, the share of logs and sawnwood imports by country of origin in 1976 and 1981 was as follows:

| | Percentage shares[a/] | | | |
|---|---|---|---|---|
| Country of origin | 1976 | | 1981 | |
| Indonesia | 21.6 | (23.3) | 14.0 | (15.4) |
| Malaysia | | | | |
| Sabah | 18.7 | (20.2) | 16.9 | (19.0) |
| Sarawak | 3.7 | (4.0) | 8.6 | (9.7) |
| Malaya | 0.3 | (0.1) | 0.2 | (0.0) |
| Philippines | 4.3 | (4.6) | 4.8 | (5.0) |
| Papua New Guinea | 0.8 | (0.8) | 1.4 | (1.6) |
| Others | 0.5 | (0.4) | 0.9 | (1.0) |
| Sub-total | 49.0 | (53.4) | 46.8 | (51.7) |
| USA | 24.8 | (24.2) | 25.8 | (25.3) |
| Canada | 3.8 | (0.6) | 6.4 | (1.1) |
| Sub-total | 28.6 | (24.8) | 32.2 | (26.4) |
| USSR | 18.2 | (19.4) | 17.4 | (19.3) |
| New Zealand | 2.1 | (2.0) | 2.3 | (1.7) |
| Others | 1.2 | (0.4) | 1.3 | (0.9) |
| Total 100.0 | | (100.0) | 100.0 | (100.0) |

a/ Figures in parenthesis : logs only.

Source: Table 5.

During the years 1976-81, the import structure of timber by country of origin (logs and sawnwood) showed a dramatic change, reflecting the availability of forest resources and relative differences in the log export restraint policy adopted by different countries. The main features of these changes are as follows:

(1) The import share of "South Sea" logs of tropical hardwood species decreased its share by about 3% during this period, partly due to the depression of domestic plywood market, and partly due to more restrictive measures on log exports enforced by Indonesia and Sabah. Timber imports from Sarawak and Papua New Guinea, both of which have adopted relatively liberal log-export policy so far, increased sharply during the same period.

(2) On the other hand, the import share of softwood, logs and sawnwood from the United States and Canada increased from 28.6% to 32.2%, while that of the USSR decreased slightly, reflecting their relatively higher price compared to other softwood species. In recent years the United States and Canada have been keener on exporting their sawnwood to the Japanese market than the USSR.

(3) Most of the imported logs from New Zealand is radiata pine which is at present used in Japan as package materials. Although the import share of logs and sawnwood from New Zealand is still small, it will continue to increase in the future, because their sawn products have been increasingly accepted on the Japanese market.

The above discussion clearly shows that the Japnaese wood-procesing industry has been confronted with a number of difficulties in recent years. It is also true that the "structural" problems facing the Japanese wood-processing industry affect the primary and secondary processing sectors differently. In general, the primary processing sectors have experienced more adjustment problems than the secondary processing sectors. It is quite

Table 5. Japanese imports of logs and sawnwood

(Thousand $m^3$)

| Year | Total | | Southeast Asia and the Pacific ('South Sea' logs) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sub total | | Indonesia | | Malaysia | | Sabah | | Sarawak | | Malaya | | Philippines | | Papua New Guinea | | Others | |
| | | Logs | | Logs | | Logs | | Logs | | Logs | | Logs | | Logs | | Logs | | Logs | | Logs |
| 1976 | 44890 | 41589 | 22388 | 22205 | 9695 | 9678 | 10205 | 10108 | 8413 | 8410 | 1665 | 1665 | 127 | 33 | 1952 | 1902 | 337 | 326 | 199 | 191 |
| 1977 | 45465 | 41980 | 21678 | 21391 | 9632 | 9612 | 9713 | 9552 | 8118 | 8110 | 1405 | 1405 | 190 | 37 | 1738 | 1664 | 364 | 342 | 231 | 221 |
| 1978 | 46511 | 42654 | 22364 | 22061 | 9231 | 9217 | 10679 | 10518 | 9042 | 9031 | 1466 | 1465 | 171 | 22 | 1908 | 1805 | 332 | 315 | 214 | 206 |
| 1979 | 49902 | 44786 | 23078 | 22650 | 10043 | 9976 | 10884 | 10718 | 8457 | 8437 | 2276 | 2266 | 151 | 15 | 1539 | 1401 | 389 | 348 | 223 | 207 |
| 1980 | 43083 | 37510 | 19656 | 19089 | 9030 | 8904 | 8571 | 8373 | 6240 | 6179 | 2185 | 2173 | 146 | 21 | 1359 | 1166 | 447 | 419 | 249 | 227 |
| 1981 | 33118 | 29220 | 15493 | 15107 | 4629 | 4506 | 8482 | 8370 | 5581 | 5538 | 2846 | 2832 | 55 | 0 | 1595 | 1467 | 465 | 455 | 322 | 309 |

| Year | North America | | | | | | USSR | | New Zealand | | Others | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sub total | | USA | | Canada | | | | | | | |
| | | Logs | | Logs | | Logs | | Logs | | Logs | | Logs |
| 1976 | 12848 | 10308 | 11136 | 10051 | 1712 | 257 | 8168 | 8056 | 934 | 825 | 552 | 195 |
| 1977 | 13264 | 10632 | 11176 | 10201 | 2088 | 431 | 8883 | 8717 | 1070 | 885 | 620 | 255 |
| 1978 | 13434 | 10637 | 11306 | 10325 | 2128 | 312 | 8961 | 8834 | 1035 | 813 | 717 | 309 |
| 1979 | 16365 | 12740 | 13936 | 12400 | 2429 | 340 | 8013 | 7879 | 1288 | 995 | 1158 | 522 |
| 1980 | 14865 | 10751 | 11829 | 10279 | 3036 | 472 | 6297 | 6158 | 1135 | 795 | 130 | 717 |
| 1981 | 10673 | 7725 | 8532 | 7402 | 2146 | 323 | 5770 | 5647 | 755 | 497 | 422 | 244 |

Note: Customs clearance basis

Source: Ministry of Finance, Trade Statistics.

understandable that the latter, (for example, the furniture industry), has more flexibility to adjust to new situations than the former (for example, plywood industry). The products manufactured by the secondary processing sector are much more diversified than those produced by the primary processing sector. For example, furniture manufacturers can develop new products to meet a change in market preference more easily than plywood millers, so that the former can be more adaptable to manufactured imports from developing countries than the latter. As a matter of fact, Japan is a net importer of wooden furniture: in 1981 the export value was 21.4 billion Yen and import value was 38.6 billion Yen.[1/]

## 3. Supply Constraints on Unprocessed Logs in Japan

### 3.1. Prospects for Domestic Supply of Round Wood and Import Constraints on "South Sea" logs

One of the major problems which the Japanese wood-processing industry has to tackle seriusly in the future is supply constraints on round logs. Based upon the "Long Range Demand and Supply Projection for Important Forest Products", the latest version of which was published in May 1980 by the Ministry of Agriculture, Forestry and Fishery (hereafter, M.A.F.F.), a brief

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1/ Furnitures' Export - Import of Japan 1977-1981, published by International Development Association of the Furniture Industry in Japan. However, the import share of wooden furniture compared to domestic apparent consumption (gross output + import - export) is still very small: 2.6% (1980).

Table 6. Forecast of wood demand and supply

(Unit: 1 million $m^3$) (Percentage)

| Supply-Demand | Uses and sources | Volume 1976 | Volume 1986 | Volume 1996 | Share 1976 | Share 1986 | Share 1996 |
|---|---|---|---|---|---|---|---|
| Demand | Sawn timber | 57.4 | 62.6 | 65.4 | 55 | 53 | 49 |
| | Pulpwood | (5.4)<br>29.6 | (7.0)<br>36.1 | (7.5)<br>41.9 | 28 | 30 | 34 |
| | Plywood. Fibreboard, particleboard | (2.2)<br>12.8 | (3.6)<br>14.9 | (3.3)<br>17.6 | 12 | 13 | 13 |
| | Other uses | 4.6 | 4.8 | 5.3 | 5 | 4 | 4 |
| | Total | (7.6)<br>104.4 | (10.1)<br>118.4 | (10.8)<br>133.2 | 100 | 100 | 100 |
| Supply | Domestic supply | (7.6)<br>38.2 | (10.0)<br>46.2 | (10.8)<br>57.7 | | | |
| | Imports | 65.2 | 72.2 | 73.5 | | | |
| | Total | (7.6)<br>104.4 | (10.0)<br>113.4 | (10.8)<br>133.2 | | | |
| Proportion of import (per cent) | | 63.4 | 61.0 | 56.7 | | | |

( ) = mill-residues
Source: M.A.F.F. 1980.

discussion will be made concerning the future demand and supply of wood and wood products.[1/]

A summary of the 1980 projections for the future demand and supply of wood and wood products, using the 1976 results of 104.4 million $m^3$ as the base, is given in Table 6. In this projection for timber demand, wood products are classified into five categories: (1) sawnwood, (2) pulp wood, (3) wood based panels: plywood, fibreboard and particle board, (4) "shiitake" (mushroom) cultivation logs and fuelwood, and (5) other uses. In Table 6, the results of demand projection based on the above classification are reported for the years 1986 and 1996.

The method of demand projection used for this purpose is rather simple: the future growth rate of timber demand is obtained basically by multiplying income elasticity of timber demand by the anticipated future growth rate in national income. According to Nomura (1981), this projection used the economic growth rates adopted by the "New Economic Society's Seven Year Plan", i.e. 5.5% of annual growth rate until 1985, 5.0% for 1986 to 1990, and 4.5% for 1991 to 1996. During this period income elasticity of timber demand is estimated to be 0.24-0.25. This coefficient of income elasticity of timber demand is based on the lowest value estimated during the years of 1961-73.

Under the assumptions stated above, total volume of timber demand is projected to be 118.4 million $m^3$ in 1986 and 133.2 million $m^3$ in 1996. The share of timber demand by end use is also given in Table 6; the main feature is that the share of sawn timber will drop by almost the same amount that the share of pulp wood will rise, while that of plywood, fibreboard and particle board will remain unchanged.

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1/ For an excellent summary of this subject, see Nomura, I. (1981), "Long Range Timber Demand/Supply Prospects in Japan and Some Problems" prepared for the North American Conference on National Forest Sector Models of IIASA, Williamsburg, U.S.A., November 30 - December 4, 1981.

However, the 1980 official projection on the future demand of wood products should be treated with great caution. First, annual economic growth rates used for this projection may be slightly overestimated; real GNP growth rate (actual) was about 5.0% per annum between the period of 1976-80. Second, there is no guarantee that 0.24-0.25 income elasticity coefficient reflects the reality; in other words, an even smaller coefficient may be possible, taking into account a declining trend in the housing construction sector. As a matter of fact, the actual volume of total timber demand since 1980 has been different from the target range so far.

Now let us turn to the supply side of the 1980 long range projection Generally speaking, the task of projecting the future supply of timber in Japan is much more difficult than that of demand projection, although the demand projection itself is far from perfect. As shown in Table 6, the proportion of imported wood supply is projected to decline to the level of 61.0% in 1986, and then 56.7% in 1996, based on the future increase in domestic forest resources, mainly post-war plantations. As far a domestic supply of timber is cncerned, Nomura (1981) concludes that "46.2 million $m^3$ in 1986 and 57.7 million $m^3$ in 1996 are not at all over-optimistic" taking into account the fact that "the potential capacity of the domestic timber supply (softwood, to be precise) from the 10 million hectares of man-made forests rapidly-expanded after the war, is estimated to reach 60-70 million $m^3$ in the not too distant future, even if we make substantial allowances for unproductive plantations".1/

The problem of domestic timber supply of softwood species is whether domestic timber is competitive pricewise as against North American timber.

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1/ See Nomura (1981) op. cit., p.6; underline made by the author.

The domestic timber industry faces such disadvantages as severe logging conditions in the forests and very fragmented structure in forest ownership.[1/]

In terms of the supply of raw materials to the manufacture of plywood, fibreboard and particle board, Japan will continue to depend heavily on the import supply of "South Sea" logs. According to the 1980 projection, the import volume of "South Sea" logs is forecast to be 19.9 million $m^3$ in 1986 and 17.3 million $m^3$ in 1996; about 57-60% of total imports of "South Sea" logs will be used for plywood[2/] and the rest for sawmilling and pulp. With regard to the manufacture of plywood, it is projected that 87% of raw materials used in the plywood industry will come from "South Sea" logs in 1986, although this figure is forecast to be reduced substantially to the level of 72% in 1996 reflecting the log-export restraint policies adopted by some Asian developing countries, which are considered to continue in the future.

It is quite difficult to project the future supply level of "South Sea" logs, which depends on (1) limitation of forest resources in Asia and the Pacific, and (2) continuity of log-export restraint policies. In terms of restrictive measures adopted so far, log-exporting developing counties in Asia and the Pacific are very heterogeneous; generally speaking, Sarawak and Papua New Guinea are more liberal than Indonesia and Sabah. As discussed briefly in the previous chapter, diversification of import of "South Sea" logs by country and region of origin has already taken place in recent years. The next section will be devoted to the discussion on how Japan can respond to import constraints on round logs.

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1/ Ibid., p.6.
2/ In Japan the manufactures of fibreboard and particle board mainly receive their raw materials supplies from mill-residues.

3.2. Response to supply constraints on Unprocessed Logs

Among the primary processing sectors, the plywood industry has been and probably will be hit most by supply constraints on unprocessed logs, because supply constraints will be much more severe on tropical hardwood than softwood logs.

At present, 96% of round wood for plywood use come from "South Sea" logs, mainly lauan logs. Such dependence of the Japanese plywood industry on lauan logs may be reduced to some extent over the next decade as more intensive use of 'commercially-less-acceptable species' can be made for this purpose.

(1) Substitution possibility of softwood for hardwood plywood

The production techniques for utilizing softwood of small diameter in the manufacture of plywood have already been well known from the long experience of softwood producing countries such as the United States. However, it is still questionable to what extent the Japanese plywood industry will be able to convert its technology to use softwood raw materials for several reasons.

First, the domestic supply of softwood species, which are expected to increase their harvest from man-made forests, consists of Japanese cedar and Japanese cypress (hinoki). Many technical problems remain to be solved before these species can be used for commercial production.

Second, the plywood production based on imported softwood mainly from the United States and U.S.S.R. is also questionable. Japan cannot expect to import more round logs of softwood species from the United States due to limitation of forest resources and the United States is now more keen on exporting wood based panels to Japan. On the other hand, the U.S.S.R.

has started to produce plywood using softwood species, so that the availability of softwood logs for the Japanese plywood industry will be uncertain in the future.

Third, the Japanese plywood industry has to make large investments in the production lines and equipment to enable them to utilize softwood logs. Under the deptressed market conditions, it may be too costly to do this.

For these reasons, it must be admitted that the possibility of substitution of softwood for hardwood plywood will be very limited in commercial production under the current situation of Japan.

(2) Development of other wood based panels and non-wood materials

Such wood based panels as particle board and fibreboard are partially substitutable for plywood. As a matter of fact, the production of these wood based panels has increased remarkably so far, except during recession years. However, these industries have basically been confronted with the same problems as the plywood industry from the standpoint of supply constraints on raw materials. As will be discussed later, the particleboard and fibreboard industries have depended entirely on mill-residues for the supply of raw materials.

Another possibility is to establish new factories suitable for utilizing low-quality hardwood logs and thinnings just like European factories. However, the prices of these raw materials compared to mill-residues are too high for this type of factories in Japan. Although it is true that substitution between two types of wood based panels in

some areas has occurred recently, this trend, therefore, will be limited to some extent.

In the areas of industrial materials for housing construction, there is also substitution between wood and non-wood products. In fact there has been a decreasing trend in the ratio of traditional Japanese-style houses in total housing construction. As fire regulations applied to building construction become more strict, the demand for construction materials has also shifted toward non-wood or mixed products such as plaster board, wood-cement board, asbestos-cement board and so on. These changes in demand structure have begun to cause a substantial effect on the plywood industry in recent years.

Substitution between wood and non-wood (or mixed) products has been, and will be more important than subtitution among wooden products on the Japanese market.

In sum, it is quite difficult for the Japanese plywood industry to make a positive response to import constraints on lauan logs under the current economic and technical conditions. From Japan's point of view, it is desirable that a substantial effort should be directed to technical development for more efficient use of 'commercially-less-acceptable species'. This is also compatible with the long-term interests of developing countries in Asia and the Pacific.

## 4. Structural Change in the Wood-processing Industy in Japan

### 4.1. Sawmilling

The sawmilling industry in Japan has remained in a state of depression since the second oil crisis of 1979-80. During the period 1975-81 more than 2,000 sawmills were closed, nearly one-tenth of total sawmills operating in 1981 (see Table 7). A similar trend can be found concerning the number of employees. The decrease in total employees started in the mid-1960s. Over the six year period 1975-81 employment in sawmills was reduced by more than 43,000 workers, about 20% of total employees in 1975. This represents an annual rate of decline in employment of 3.7% during this period. After the 1974-75 world recession the sawnwood production increased up to the level of 38 - 39 million $m^3$ per annum in 1976-79. However, it dropped sharply from 36.8 to 32.5 million $m^3$ in the next two years.

According to industry experts the prevailing view is that the current state of depression in the sawmilling industry should be seen as a long-term, structural problem rather than a temporary one for several reasons:

First, there has been the decreasing demand for sawnwood due to a drastic fall in total housing starts since 1980. For demographic and socio-economic reasons not only total housing starts, but also the ratio of wooden houses are unlikely to increase substantially in the near future.

As shown in Table 7, about 77% of sawnwood produced in 1981 was consumed by the housing construction sector, and this share has remained quite stable over the last several years. Considering the fact that the sawmilling business tends to be influenced mainly by trends in the housing construction

Table 7. Current state of the sawmilling industry in Japan

| Year | Number of sawmills | Number of employees | (Thousand $m^3$/Percentage) Total (A) | Domestic production (by use of sawnwood) Housing construction | Civil engineering | Packing crates/ boxes | Furnitures and fixtures | Ships and automobiles | Others | (Thousand $m^3$) Sawnwood imports (B) | Total supply (C) =(A)+(B) | (Percentage) Import share (B)/(C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1975 | 23,630 | 221,356 | 37,452<br>100.0 | 29,079<br>77.6 | 1,208<br>3.2 | 2,827<br>7.5 | 2,671<br>7.1 | 281<br>0.8 | 1,386<br>3.7 | 2,612 | 40,064 | 6.5 |
| 1976 | 23,482 | 215,921 | 39,222<br>100.0 | 30,432<br>77.6 | 1,177<br>3.0 | 3,012<br>7.7 | 2,813<br>7.2 | 327<br>0.8 | 1,461<br>3.7 | 3,301 | 42,523 | 7.8 |
| 1977 | 23,136 | 207,492 | 38,171<br>100.0 | 29,335<br>76.9 | 1,234<br>3.2 | 3,090<br>8.1 | 2,819<br>7.4 | 259<br>0.7 | 1,434<br>3.7 | 3,575 | 41,746 | 8.6 |
| 1978 | 22,794 | 202,381 | 38,846<br>100.0 | 30,023<br>77.3 | 1,275<br>3.3 | 3,041<br>7.8 | 2,803<br>7.2 | 251<br>0.6 | 1,453<br>3.7 | 3,857 | 42,703 | 9.0 |
| 1979 | 22,541 | 197,570 | 39,579<br>100.0 | 30,695<br>77.6 | 1,293<br>3.3 | 3,050<br>7.7 | 2,785<br>7.0 | 286<br>0.7 | 1,470<br>3.7 | 5,116 | 44,695 | 11.4 |
| 1980 | 22,241 | 194,278 | 36,858<br>100.0 | 28,260<br>76.7 | 1,239<br>3.3 | 3,156<br>8.6 | 2,512<br>6.8 | 252<br>0.7 | 1,439<br>3.9 | 5,573 | 42,431 | 13.1 |
| 1981 | 21,535 | 177,722 | 32,557<br>100.0 | 24,921<br>76.5 | 1,116<br>3.4 | 2,959<br>9.1 | 2,114<br>6.5 | 196<br>0.6 | 1,251<br>3.8 | 3,898 | 38,445 | 10.1 |

Source: M.A.F.F., Report on Demand and Supply of Lumber 1982, Ministry of Finance, Trade Statistics, 1982.

business, it cannot be expected that this industry will get out of 'structural' depression in the near future.

Second, the sawmilling industry in Japan has been affected by the log-export restraint policies, especially export restraints on "South Sea" logs, which have been intensified by some log-producing developing countries since 1979. The consumption tend of round wood for sawmilling purpose is given in Table 8. Total consumption of round wood by sawmills decreased to a large extent in 1979-80 and 1980-81 by 7% and 12% respectively. Consumption of domestic logs for sawmilling purpose decreased by 2% and 7% in the two years, while consumption of imported logs for the same purpose fell sharply by 10% and 15% respectively. As a result the share of imported logs to total log consumption by sawmills decreased from 61.7% in 1979 to 57.5% in 1981, although it remained at a high level.

The extent of decrease in imported wood consumption is different by source:

| | 1979-80 | 1980-81 |
|---|---|---|
| S.E. Asia[a/] | - 19% | - 17% |
| US | - 6% | - 15% |
| USSR | - 16% | - 9% |
| New Zealand | - 0% | - 22% |
| Others | - 3% | - 22% |

a/ See Table 8.

The substantial fall in lauan consumption relfects not only a decrease in domestic demand for lauan lumber, but also the effects of very restrictive log-export policies by some Asian developing countris.

Table 8. Round wood for sawnmilling by sources

(000 $m^3$)

| | Total | Domestic logs | | | Imported logs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sub-total | Softwood | Hardwood | Sub-total | Lauan* | US | USSR | New Zealand | Others |
| 1975 | 52,377 | 20,961 | 17,610 | 3,351 | 31,416 | 7,438 | 13,634 | 6,870 | 875 | 2,599 |
| | 100.0 | 40.0 | 33.6 | 6.4 | 60.0 | 14.2 | 26.0 | 13.1 | 1.7 | 5.0 |
| 1976 | 55,047 | 21,378 | 17,930 | 3,448 | 33,669 | 7,635 | 15,041 | 7,562 | 1,020 | 2,401 |
| | 100.0 | 38.8 | 32.5 | 6.3 | 61.2 | 13.9 | 27.3 | 13.7 | 1.9 | 4.4 |
| 1977 | 53,871 | 20,526 | 17,170 | 3,356 | 33,345 | 7,264 | 15,196 | 7,241 | 1,100 | 2,544 |
| | 100.0 | 38.1 | 31.9 | 6.2 | 61.9 | 13.5 | 28.2 | 13.5 | 2.0 | 4.7 |
| 1978 | 54,976 | 20,482 | 17,200 | 3,287 | 34,494 | 7,469 | 15,497 | 7,836 | 1,132 | 2,560 |
| | 100.0 | 37.3 | 31.3 | 6.0 | 62.7 | 13.6 | 28.1 | 14.2 | 2.1 | 4.7 |
| 1979 | 56,012 | 21,461 | 18,147 | 3,314 | 34,551 | 6.813 | 16,824 | 7,072 | 1,371 | 2,471 |
| | 100.0 | 38.3 | 32.1 | 5.9 | 61.7 | 12.2 | 30.0 | 12.6 | 2.5 | 4.4 |
| 1980 | 52,074 | 20,953 | 17,762 | 3,191 | 31,121 | 5,547 | 15,870 | 5,937 | 1,368 | 2,399 |
| | 100.0 | 40.2 | 34.1 | 6.1 | 59.8 | 10.7 | 30.5 | 11.4 | 2.6 | 4.6 |
| 1981 | 45,945 | 19,527 | 16,762 | 2,765 | 26,418 | 4,621 | 13,434 | 5,408 | 1,072 | 1,879 |
| | 100.0 | 42.5 | 36.5 | 6.0 | 57.5 | 10.1 | 29.2 | 11.8 | 2.3 | 4.1 |

* Imported mainly from the Philippines, Indonesia and Malayasia (Sabah and Sarawak).

Source: M.A.F.F., Report on Demand and Supply of Lumber 1982.

Third, there has been a steady increase in imported sawnwood products, especially from the United States. The import share of sawnwood in the Japanese market rose from 6.5% in 1975 up to 13.1% in 1980, although it dropped to 10.1% in 1981, reflecting the very sluggish demand for sawnwood.

In order to compete with imported sawn products on the domestic market, the sawmillers in Japan are expected to improve their product mix to semi-finished products with high value-added, for example, house components and planed parts for millworks, so as to meet future changes in demand structure of sawn products.

Last, more than 90% of total sawmills are of small and medium scale, and there are in fact too many sawmills in operation (21,535 in 1981) to meet domestic demand for sawn products. This partly causes undue competition under the depressed market situation which leads to unstable movement of whoesale prices of sawn products.

It should be noted that the number of sawmills using only domestic logs tended to increase from 7,264 in 1975 to 7,736 in 1981, while that of sawmills consuming both domestic and imported logs or only imported logs tended to decrease sharply from 16,356 in 1975 to 13,775 in 1981. In terms of scale of production, small sawmills of less than 22.5 KW in output power are dominant in the former, while big sawmills with more than 150 KW in installed equipment concentrate on the latter.

Consequently, the production system could be rationalized and mechanized further, taking into account the steep rise in costs of labour and raw materials. Since the use of domestic logs for sawmilling purpose will be enhanced in the long run, the production system itself could be changed so as to meet the requirements for utilization of domestic softwood logs of small diameter to be logged in man-made forests.

4.2. Plywood

In historical perspective it seems that the Japanese plywood industry has now come to a turning point.[1/]

In the 1950s the Japanese plywood industry enjoyed the most prosperous peirod as an export sector. Since the large quantity of plywood exports to the U.S. Market caused a trade friction between two countries, the Japanese manufacturers had to take valuntary export restraints, for fear that the U.S. government would impose more restrictive measures on Japanese plywood. In the 1960s the plywood industry of log-exporting countries like the Philippines and newly industrializing countries such as the Republic of Korea and the Province of Taiwan expanded at an unprecedented pace and came to the fore as major exporters to the world market. Since the beginning of 1960s exports of lauan plywood from Japan have dwindled rapidly. Thus, the Japanese hardwood plywood, except some Hokkaido-made products using domestic hardwood species, has virtually been replaced on the overseas markets by the products produced by the above mentioned developing countries.

In the 1960s when Japan entered a decade of high economic growth, domestic demand for plywood steadily expanded through a large increase in the demand for construction materials. Therefore, in spite of a drastic fall in exports, the Japanese plywood industry could expand its production capacity and modernize production equipment remarkably until 1973.

After the first oil crisis followed by the world recession 1974-75, domestic demand for construction materials was sharply reduced by the slow-down of housing construction, which brought about a serious depression to the Japanese plywood industry. From late 1978 up to the middle of 1980 the

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1/ See Shigesawa, S. (1980), "The Wood-processing Industry in Japan - a progress report", IDE, Tokyo.

Table 9. Number of plywood mills (including veneer mills)

Number/Percentage Share

| Year | Total | Veneer only | Regular plywood only | Both processed and regular | Processed plywood only |
|---|---|---|---|---|---|
| 1975 | 726 | 57 | 200 | 52 | 417 |
| | 100.0 | 7.9 | 27.5 | 7.2 | 57.4 |
| 1976 | 711 | 56 | 197 | 47 | 411 |
| | 100.0 | 7.9 | 27.7 | 6.6 | 57.8 |
| 1977 | 694 | 60 | 184 | 40 | 410 |
| | 100.0 | 8.6 | 26.5 | 5.8 | 59.1 |
| 1978 | 666 | 55 | 180 | 37 | 394 |
| | 100.0 | 8.3 | 27.0 | 5.5 | 59.2 |
| 1979 | 654 | 55 | 179 | 33 | 387 |
| | 100.0 | 8.4 | 27.4 | 5.0 | 59.2 |
| 1980 | 644 | 53 | 166 | 33 | 392 |
| | 100.0 | 8.2 | 25.8 | 5.1 | 60.9 |
| 1981 | 621 | 46 | 153 | 31 | 391 |
| | 100.0 | 7.4 | 24.6 | 5.0 | 63.0 |

Source: See Table 8.

plywood business showed a favourable turn, partly because the demand for plywood increased temporarily due to the general improvement of the domestic economy. However, since the middle of 1980 following the second oil crisis the plywood industry has again fallen into a 'structural' depression; domestic demand for plywood has been reduced drastically by a substantial drop in housing starts, while costs of raw materials such as round wood and adhestives have remained at a high level.

As shown in Table 9, the total number of plywood mills has decreased due to an unfavourable market situation in recent years. In 1975-81 105 plywood mills were closed, which corresponded to 17% of plywood mills operating in 1981. In particular, the number of regular plywood mills has decreased sharply, with many mills closing and bankruptcies having occurred since the 1974-75 recession.

Independent veneer mills accounting for 7 or 8% of total number of plywood mills are of relatively small scale consuming mainly domestic species.

In the regular plywood industry (i.e. those producing standard plywood) the larger mills with more than 100 employees account for about 60% of the total number of regular plywood mills. However, nearly 80% of the total number of plywood mills (producing regular and processed plywood) can be characterized as small-scale mills with less than 100 employees, reflecting the fact that in the processed plywood industry the majority of total mills are of very small scale.

At the end of 1981 the total number of employees in veneer and plywood mills was 40,600. This figure is 21% less than the total employees in 1978.

Tables 10 and 11 show the current state of regualr and processed plywood production respectively. The production of regular plywood in 1979 was 1,449 million $m^2$, showing a sign of recovery from the 1974-75 recession. Since then, however, the production trend has changed downwards again. In 1981 the

Table 10. Regular plywood production

| Year | Production (million $m^2$) | Shares of plywood by thickness (percentage) | | | | |
|---|---|---|---|---|---|---|
| | | Total | Less than 3 mm | 3-6 mm | 6-12 mm | Over 12 mm |
| 1975 | 1,183 | 100.0 | 47.7 | 29.2 | 4.5 | 18.6 |
| 1976 | 1,334 | 100.0 | 45.0 | 30.4 | 5.3 | 19.3 |
| 1977 | 1,308 | 100.0 | 41.6 | 30.2 | 4.9 | 23.3 |
| 1978 | 1,395 | 100.0 | 42.9 | 28.6 | 4.4 | 24.1 |
| 1979 | 1,449 | 100.0 | 41.8 | 28.5 | 5.0 | 24.7 |
| 1980 | 1,344 | 100.0 | 42.6 | 26.9 | 4.9 | 25.6 |
| 1981 | 1,188 | 100.0 | 42.8 | 26.0 | 4.9 | 26.2 |

Source: See Table 8.

Table 11. Processed plywood production

(Million $m^2$/ Percentage)

| Year | Total production | Polyester overlay | PVC overlay | Print overlay | Coloured plywood | Fancy plywood | Others |
|---|---|---|---|---|---|---|---|
| 1975 | 417 | 21 | 20 | 170 | 34 | 67 | 105 |
| | 100.0 | 5.0 | 4.8 | 40.8 | 8.2 | 16.0 | 25.2 |
| 1976 | 425 | 26 | 20 | 158 | 35 | 75 | 111 |
| | 100.0 | 6.1 | 4.7 | 37.2 | 8.2 | 17.6 | 26.1 |
| 1977 | 421 | 25 | 19 | 165 | 29 | 86 | 97 |
| | 100.0 | 5.9 | 4.5 | 39.2 | 6.9 | 20.4 | 23.0 |
| 1978 | 425 | 24 | 18 | 170 | 31 | 86 | 96 |
| | 100.0 | 5.6 | 4.2 | 40.0 | 7.3 | 20.2 | 22.6 |
| 1979 | 444 | 23 | 18 | 184 | 32 | 84 | 103 |
| | 100.0 | 5.2 | 4.1 | 41.4 | 7.2 | 18.9 | 23.2 |
| 1980 | 394 | 25 | 16 | 158 | 25 | 83 | 87 |
| | 100.0 | 6.3 | 4.1 | 40.1 | 6.3 | 21.1 | 22.1 |
| 1981 | 337 | 24 | 16 | 133 | 24 | 65 | 75 |
| | 100.0 | 7.1 | 4.7 | 39.5 | 7.1 | 19.3 | 22.3 |

Source: See Table 8.

production of regular plywood was 1,188 million $m^2$, only 82% of the 1979 level.

Thick plywood panels of over 12mm have expanded their share in the regular plywood production, compared to thin plywood panels of les than 3 mm. In 1981 the share of thick panels of over 12 mm amounted to 26% of total production.

There are two main reasons for this trend. First, there has appeared a new demand for thicker panels used as concrete-form panels for construction and as building materials for roofs and floors. Second, the average quality of imported lauan logs has been lowered in recent years so that it is becoming more difficult to produce thinner panels which require higher quality raw materials.

Turning to the processed plywood production, it has recovered slightly from the 1974-75 recession up to 1979, just as regular plywood did. Total production of processed plywood amounted to 444 million $m^2$ in 1979. Since then, however, the production of processed plywood has decreased, partly due to a substantial reduction in its demand for interior decoration and furniture manufacture, and partly due to competition of particle board and non-wooden materials such as plaster board in the same market.

As shown in Table 11, print over-lay plywood ranks first among processed plywood, accounting for 40% of total production in recent years. Next comes fancy plywood (which is made by facing core plywood with a high-quality sliced veneer) the share of which has increased up to 20% in 1981. These products have been widely used in the areas of interior decoration and furniture.

At present the Japanese plywood industry has been confronted with enormous difficulties. Among others the following problems should be shortly discussed here:

(1) Taking account of the lower level of housing starts and the increasing share of non-wooden houses compared to traditional Japanese wooden houses

style, it is very unlikely to expect that the demand for plywood will pick up in the near future. It is, therefore, imperative to reduce further the total capacity of plywood production so as to meet its future demand level.

(2) 96% of round wood used for plywood production in Japan are "South Sea" logs, mainly lauan species. Considering the availability of forest resources and restrictive log-export measures adopted by some Asian developing countries, one cannot expect that Japan will be able to maintain the secure supply of tropical hardwood in the form of round wood. It is, therefore, necessary to diversify the sources of raw materials by making more use of softwood and the "commercially-less-acceptable species" for plywood purpose.1/ In order to accoplish these objectives some financial assistance to the plywood manufacturers may be indispensable to enable them to introduce new production systems necessary to utilize softwood species and the "commercially-less-acceptable species".

(3) The level of plywood imports to the Japanese market is still negligible partly because of the escalating structure of tariffs imposed on wood and wood products.2/ However, the hardwood plywood produced by Asian developing countries like Indonesia and the softwood structural panels made in the United States and Canada would be imported more to the domestic market if import duties were to be eliminated or reduced to a substantially lower level.3/ In addition, the competitive position of such industrial materials as particle board and fibreboard, and non-wooden panels like plaster board will be enhanced in the near future unless some drastic measures for rationalization

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1/ See also Chapter 3.
2/ See Chapter 6-3 for a detailed discussion.
3/ However, this possibility might be limited to some extent because of non-price competitiveness and difference in product standard. See Chapter 6-3.

should be taken to reduce production costs and the development of new products to meet changes in market preference.

## 4.3. Glued Laminated Timber

Based upon the introductin of synthetic-resin adhesives and imported technology, the commercial production of glued laminated timber in Japan started in the 1950s and developed remarkably in the 1960s and 70s.

As shown in Table 12, there were 211 factories in operation at the end of 1981. The number of factories and employees in this industry has been increasing steadily, in contrast to other wood-processing industries, even under the depressed market since the world recession 1974-75. The greater part of these factories are of relatively small scale, the factory of less than 30 employees accounting for 74% of the total number in 1981. The fact that most manufacturers in this industry are running their own sawmills at the same time shows the relative easiness to enter this business. As a matter of fact, the production process of glued laminated timber is rather labour-intensive and requires relatively small amount of investment in plant and equipment. However, the mechanization of labour-intensive process by introducting finger jointers, composers and high-frequency heaters has been intensified.

In 1979 production of glued laminated timber amounted to 294 thousand $m^3$, more than 14 times as high as the 1965 production (20 thousand $m^3$). In 1980 and 81, however, this industry experienced two-years of successive decreases in production, since it was heavily hit by a severe depression in the housing market.

In terms of end use of glued laminated timber, the products for decorative use accounted for 64% of total production in 1981. Glued laminated timber

Table 12. Current state of the glued laminated timber industry

| Year | Number of factories | Number of employees | Production (Thousand $m^3$ /Percentage) | | |
|---|---|---|---|---|---|
| | | | Total | Decorative | Structural |
| 1975 | 153 | 6,411 | 218<br>100.0 | 157<br>72.0 | 61<br>28.0 |
| 1976 | 161 | 6,569 | 240<br>100.0 | 167<br>69.6 | 73<br>30.4 |
| 1977 | 184 | 7,282 | 248<br>100.0 | 171<br>69.0 | 77<br>31.0 |
| 1978 | 189 | 7,559 | 261<br>100.0 | 175<br>67.0 | 86<br>33.0 |
| 1979 | 193 | 7,852 | 294<br>100.0 | 176<br>60.0 | 118<br>40.0 |
| 1980 | 204 | 8,325 | 284<br>100.0 | 169<br>59.5 | 115<br>40.5 |
| 1981 | 211 | 8,465 | 251<br>100.0 | 160<br>63.7 | 91<br>36.3 |

Source: Japan Laminated Timber Manufacturers' Association.

has been widely used as housing materials for interior decoration such as pillars, thesholds, lintels, stair step board, balustrade, and so on. In addition to the decortive use, the demand for structural use has been increasing steadily over the last decade. The structural laminated timber can substitute for sawnwood. Although the production level of the former is still negligible compared to that of the latter, there are numerous development opportunities for structural laminated timber in the future.

Generally speaking, glued laminated timber which makes more efficient use of raw materials is a promising product in the long run, considering the limited availability of imported raw materials. At present, much interest has been directed to the development of large-dimensioned, stress-bearing, structural laminated timber for building construction.

## 4.4. Particle board

In Japan the commercial production of particle board started in 1953, its production technology and equipment having been imported from the Federal Republic of Germany in 1951. Since then, except for recession years in 1965 and 1974-75, the particle board industry had expanded its production remarkably.

After the stagnation of production in 1977-78, the production of particle board suddenly increased by 34% in 1979 compared to the previous year. This is partly because relatively cheaper particle board substituted plywood since the price of plywood incresed due to a sharp rise in prices of "south Sea" logs. Over the last decade the production of particle board quadrupled in Japan. Similar to other wood-processing industries, however, the particle board industry was adversely influenced by a severe setback in housing business in 1981 so that the level of production was reduced to 74 million

$m^2$ in 1981 representing a decline of 13% compared with the previous year (see Table 13).

At the end of 1981 there were 19 factories in operation. The total capacity of these factories is estimated to be 90 million $m^2$ per annum. The production capacity of the biggest factory at the moment is about 12 million $m^2$ per annum. Most of the particle board factories were established by plywood manufacturers for the purpose of effiently using mill-residues.

The particle board factories have generally been keeping close relations with plywood manufacturers in order to secure their supply of raw materials such as mill-residues and chips. In 1981 72% of total raw materials (14 million $m^3$) used in the particle board industry were based on mill-residues of imported logs, and about 90% of mill residues of imported logs were lauan coming from plywood mills. Since the steady supply of tropical hardwood is far from reassuring, it is possible to diversify sources sof raw materials by fuller use of domestic thinnings of softwood species (within limits set by the process and required properties of the boards)

Table 13 also shows the share of production by end use of particle board. The main users of particle board are the manufacturers of furniture and joinery, and electronic equipment as well as the construction sector. These three sectors accounted for more than 90% of total consumption of particle board in recent years. Reflecting the depressed conditions of the housing market, the demand for particle board for construction use has been decreasing. It is, however, expected that the consumption of water-resistant particle board using melamine - or phenol-resin adhesives will be enhanced in the construction sector. This kind of particle board is a substitute for thicker plywood.

As far as the production of wooden panel is concerned, the production structure in Japan is characterized by the fact that plywood represents 82% of total wooden panels, while particle board only 9%. Judging from the average production structure of wooden panels in the world, i.e. plywood 40%, particle board 38%, fibreboard 18%, and veneer 4% (FAO 1979)[1/], Japan is still biased toward plywood production. This is because Japan could enjoy a relatively cheap and secure supply of tropical hardwood suitable for plywood production in the 1950s and 60s. Since mid-1970s this situation has changed completely. The production of particle board is affected by economies of scale so that a rise in costs of raw materils will possibly be absorbed to some extent by further rationaliztion and diversification of sources of raw materials.

## 4.5. Fibreboard

According to the Japan industrial Standard (JIS) fibreboard is broadly classified into hardboard (density more than 0.8), semi-hardboard[2/] (density 0.4-0.8) and insulation board (density less than 0.4). The statistical figures of semi-hardboard are included in those of hardboard here.

Since 1953 when commercial production of hardboard started, based on imported technology and equipment, the fibreboard industry had rapidly expanded its production capacity and recorded the highest level of production, (134 million $m^2$) in 1973. During the world recession 1974-75 the level of fibreboard production dropped by 31% compared to that of 1973. Thereafter it recovered up to the level of more than 100 million $m^2$ in 1976-80 but in late 1980 the fibreboard production again started to decrease and dropped to 96.7 million $m^2$ in 1981 (see Table 14).

1/ FAO 1979 Yearbook of Forest Products.
2/ According to the FAO standard, semi-hardboard corresponds to M.D.F. medium-density fibreboard).

Table 13. Production of particle board by end use

| Year | Production (1,000 $m^2$) | End use (Percentage) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Furniture, joinery | Electric equipment | Construction | Sewing machine | Ship building | Musical instrument | Others |
| 1975 | 45,395 | 38.1 | 22.9 | 29.8 | 1.3 | 0.9 | 3.6 | 3.4 |
| 1976 | 58,494 | 37.2 | 24.6 | 30.2 | 0.3 | 1.0 | 2.9 | 3.3 |
| 1977 | 60,085 | 43.3 | 21.8 | 27.9 | 0.4 | 0.9 | 2.6 | 3.1 |
| 1978 | 61,190 | 49.8 | 22.9 | 20.8 | 0.4 | 0.6 | 1.9 | 1.8 |
| 1979 | 81,769 | 51.9 | 22.9 | 21.1 | 0.3 | 0.4 | 1.6 | 1.8 |
| 1980 | 85,177 | 49.1 | 27.1 | 18.6 | 0.3 | 0.4 | 2.5 | 2.0 |
| 1981 | 74,105 | 51.1 | 25.8 | 16.8 | 0.3 | 0.4 | 2.9 | 2.7 |

Source: Japan Fiberboard and Particle Board Manufacturers' Association
(Note): Breakdown of deliveries excluding thin particle board.

Table 14. Production of Fibreboard
(1,000 $m^2$)

| Year | Hardboard | (%) | Insulation board | (%) | Total | (%) |
|---|---|---|---|---|---|---|
| 1975 | 70,628 | (75.5) | 22,614 | (24.3) | 93,241 | (100.0) |
| 1976 | 75,634 | (73.7) | 26,984 | (26.3) | 102,617 | (100.0) |
| 1977 | 74,510 | (71.6) | 29,567 | (28.4) | 104,077 | (100.0) |
| 1978 | 75,748 | (73.3) | 27,756 | (26.7) | 103,324 | (100.0) |
| 1979 | 78,460 | (69.8) | 33,957 | (30.2) | 112,417 | (100.0) |
| 1980 | 82,051 | (70.3) | 34,732 | (29.7) | 116,783 | (100.0) |
| 1981 | 70,673 | (73.1) | 27,000 | (26.9) | 96,673 | (100.0) |

Source: Ministry of International Trade and Industry (M.I.T.I.)

Table 15. Production of hardboard by end use
(Percentage)

| Year | Automobiles | Construction | Furniture | Electric equipment | Packages | Ship building, wagons | Others |
|---|---|---|---|---|---|---|---|
| 1975 | 32.2 | 28.7 | 13.2 | 11.6 | 6.8 | 1.5 | 6.0 |
| 1976 | 34.7 | 28.5 | 11.6 | 11.3 | 7.9 | 1.1 | 4.9 |
| 1977 | 38.6 | 24.1 | 11.2 | 11.3 | 8.4 | 0.8 | 5.6 |
| 1978 | 38.2 | 20.2 | 12.8 | 11.0 | 9.7 | 0.7 | 4.7 |
| 1979 | 34.9 | 21.7 | 14.0 | 11.4 | 9.5 | 0.7 | 5.0 |
| 1980 | 38.5 | 20.1 | 12.6 | 12.9 | 8.1 | 1.1 | 6.7 |
| 1981 | 41.5 | 18.2 | 10.7 | 13.6 | 7.4 | 2.1 | 6.5 |

Source: Japan Fiberboard and Particle Board Manufacturers' Association.

At the end of 1981 there were 14 factories in operation, 10 produced hardboard and 7 insultation board (three were producing both). At present the production capacities of hardboard and insulation board are estimated to be 95 million $m^2$ and 56 million $m^2$ respectively. By and large the fibreboard factory, especially hardboard, is of the largest scale among wood-processing industries, following the pulp factory. Similar to the particle board industry, most of fibreboard factories were established by plywood manufacturers to make efficient use of mill-residue.

The share of production by end use of hardboard is shown in Table 15. Hardboard has been widely used in the areas of automobiles (41.5%), construction (18.2%), electric equipment (13.6%), furniture (10.7%) and so on. (The figures in parenthesis are for 1981). Most of M.D.F. has been used either as furniture materials or as constructon materials for ceiling, wall partition and so on. Recently much interest has been directed to M.D.F., which is subsitutable for plywood and particle board in the manufacture of furniture. In Japan only one M.D.F. factory is in operation, its production capacity is 60 thousand tons per annum. Insulation board has been rated high as a construction material for ceilings, floors, wallboards and so on.

## 4.6. Woodchips

Table 16 shows the current state of the Japanese woodchips industry. This industry has developed as a supplier of raw materials to pulp and paper industries, and since mid 1950s to the particle board and fibreboard industries. Accompanied by a substantial increase in the demand for pulp and board, the production of wood chips expanded remarkably in late 1960s. However, it has stagnated in recent years. Although it increased significantly up to more than 16.0 million $m^3$ in 1979-80, the woodchips

Table 16. Current state of the woodchips industry

| Year | Number of mills/percentage share | | | Number of employees | Production by materials (Thousand $m^3$/Percentage) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Non-specializing | Specializing | | Total | Round logs | Mill-residues | Logging-residues |
| 1976 | 7,176<br>100.0 | 6,364<br>88.7 | 812<br>11.3 | 20,672 | 16,152<br>100.0 | 8,382<br>51.9 | 7,281<br>45.1 | 489<br>3.0 |
| 1977 | 7,049<br>100.0 | 6,238<br>88.5 | 811<br>11.5 | 19,377 | 15,928<br>100.0 | 8,239<br>51.7 | 7,251<br>45.5 | 438<br>2.8 |
| 1978 | 6,764<br>100.0 | 6,011<br>88.9 | 753<br>11.1 | 17,605 | 15,250<br>100.0 | 7,555<br>49.5 | 7,282<br>47.8 | 413<br>2.7 |
| 1979 | 6,618<br>100.0 | 5,936<br>89.7 | 682<br>10.3 | 16,876 | 16,022<br>100.0 | 7,787<br>48.6 | 7,721<br>48.2 | 514<br>3.2 |
| 1980 | 6,590<br>100.0 | 5,912<br>89.7 | 678<br>10.3 | 16,516 | 16,367<br>100.0 | 8,586<br>52.5 | 7,275<br>44.4 | 506<br>3.1 |
| 1981 | 6,305<br>100.0 | 5,651<br>89.6 | 654<br>10.4 | 14,262 | 14,564<br>100.0 | 7,853<br>53.9 | 6,449<br>44.3 | 262<br>1.8 |

Source: See Table 8.

production was sharply reduced to the level of 14.5 million $m^3$ due to the severe depression of the national economy.

The number of woodchips mills and employees has been decreasing since 1974. During six years of 1976-81, 871 woodchips mills, over 12% of the total number of mills in 1976, were closed and more than 6,400 workers, surprisingly over 30% of the total number of workers in 1976, left woodchips mills. At the end of 1981 there were 6,305 mills in operation, with about 14,000 employees. Nearly 90% of woodchips mills are non-specialized, most of which are run by sawmill owners at the same time, while the specialized mills account for only 10% of total woodchips mills. Generally speaking, woodchips mills are characterized as small-scale production of less than four employees.

The share of production by source of raw materials is as follows: round wood 54%, mill-residues 44% and logging residues 2% (1981). In recent years the production of hardwood chips has decreased slightly. The specialized mills tend to produce hardwood chips from round wood, while the non-specialized mills are making softwood chips of sawmill-residues.

As shown in Table 17, 93% of woodchips mainly coming from softwood species are purchased by pulp factories, the rest is consumed by particle board and fibreboard factories. Since the pulp and paper industries, which are main users of woodchips, have relied more on imported softwood chips to stabilize the supply of raw materials, domestic and imported softwood chips are competivite to each other. In the long run, however, the world market of woodchips will become tighter due to the overall limitation of forest resources. Consequently, structural reform and modernization of the woodchips industry to strengthen domestic supply system is of great importance.

Table 17. Supply and demand of woodchips

(Million $m^3$/Percentage)

| Year | SUPPLY | | | DEMAND | | |
|---|---|---|---|---|---|---|
| | Total | Domestic production | Import | Total | Pulp | Board |
| 1976 | 29<br>100.0 | 16<br>55.2 | 13<br>44.8 | 31<br>100.0 | 29<br>93.5 | 2<br>6.5 |
| 1977 | 30<br>100.0 | 16<br>53.3 | 14<br>46.7 | 31<br>100.0 | 29<br>93.5 | 2<br>6.5 |
| 1978 | 28<br>100.0 | 15<br>53.6 | 13<br>46.4 | 30<br>100.0 | 28<br>93.3 | 2<br>6.7 |
| 1979 | 31<br>100.0 | 16<br>51.6 | 15<br>48.4 | 33<br>100.0 | 31<br>93.9 | 2<br>6.1 |
| 1980 | 32<br>100.0 | 16<br>50.0 | 16<br>50.0 | 34<br>100.0 | 32<br>94.1 | 2<br>5.9 |
| 1981 | 27<br>100.0 | 15<br>55.6 | 12<br>44.4 | 29<br>100.0 | 27<br>93.1 | 2<br>6.9 |

Source: See Table 8.

Note: Demand data from MITI (monthly report).
The slight excess of demand over supply is due to the slightly different reporting conventions used in the various sources.

## 5. The Distribution System of Wood and Wood Products in Japan

### 5.1. Distribution System of Wood and Wood Products

The distributin system of wood and wood products in the Japanese market is highly diversified in terms of quantity and kind of wood and wood products.

The latest report on timber distribution structure (1980) published by M.A.F.F. shows that there were 18,792 enterprises in charge of distributing wood and wood products, apart from manufacturers of sawnwood and plywood who are actually engaged in distributing their products in greater or lesser degree:

| | |
|---|---|
| Sawnwood auction market | 576 |
| Sawnwood distribution center | 69 |
| Wholesaler | 4,830 |
| Retailer | 13,317 |
| Total | 18,792 |

The sawnwood auction market is a distribution system where a large number of sellers and buyers make spot transactions either by auction or tender in the regular market. This market plays a fairly big role in the determintion of the general price level of wood and wood products.

The sawnwood distribution center is a group of wholesalers engaged in trading wood and wood products under a center managing company. The sawnwood distribution center was established in the 1960s mainly in the Kanto district near Tokyo for the purpose of providing a sales center close to customers.

At the end of 1980 there were 18,147 dealers (wholesalers 27%, retailers 73%) engaged in this business. For the sake of statistical convenience, the dealers whose sales to such direct users as carpenters and building contractors represent less than 30% of their total sales are classified as wholesalers, while the other dealers are called retailers. Except for some

wholesalers specializing in imported timber, the distrinction between wholesalers and retailers is quite ambiguous in the timber distributin business. Most retailers, however, tend to trade in non-wooden construction materials as well as wood products.

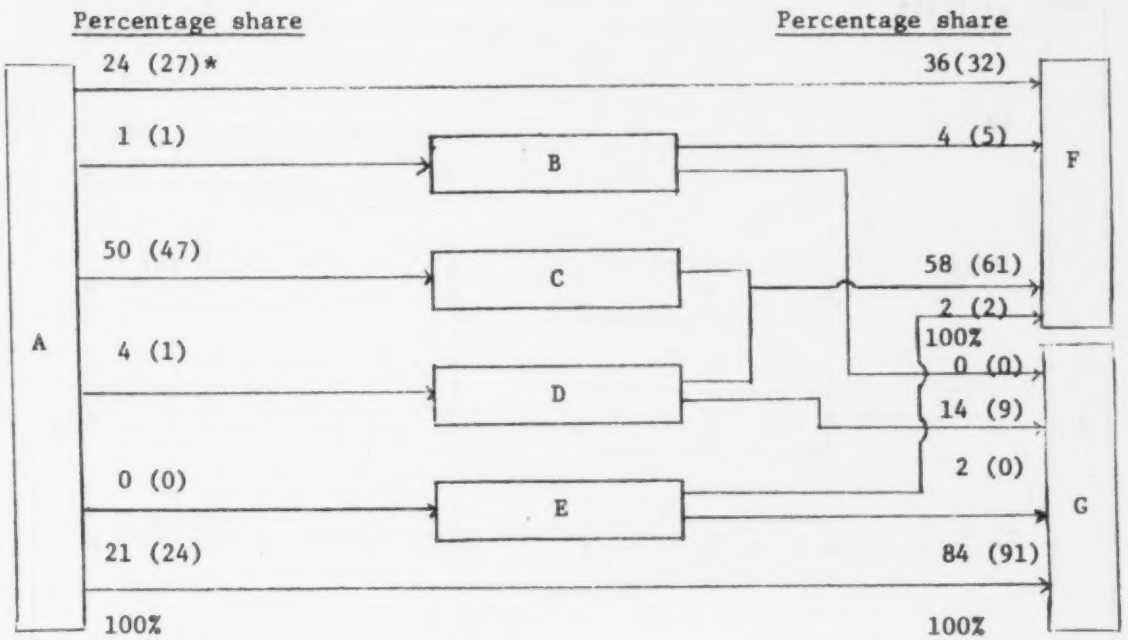
In what follows, the general characteristics of distribution channels in the trade of imported logs, sawn softwood lumber from imported logs and plywood will be shortly discussed, based on the M.A.F.F. report mentioned above.

As shown in Figure 2, the distribution channel of imported logs in the Japanese market is relatively simple. The main stream of trade is from trading companies (importers) to sawmills through wholesalers, while direct sale of imported logs from trading companies to sawmills constitute another important channel, acocunting for about one-third of total purchase of sawmills. In the case of hardwood logs for plywood use from Southeast Asia and the Pacific, direct sales from importing firms to plywood mills is dominant, accounting for more than 80% of the total purchases of plywood manufacturers.

The number of log importers increased sharply from about 140 firms in 1970 to about 330 firms in 1980. In recent years relatively small trading companies, dealers and sawmill firms have tended to enter the log importing business, dealing in rather small volumes of timber. On the other hand, several big trading companies, Sogoshosha, have curtailed their forest business abroad which is rather risky under the current circumstances.

Figure 3 shows the distribution channel of sawn softwood from imported logs. About 40% of total sales from sawmillers to consumers are through direct trade between them. Another important distribution route is by way of wholesalers and retailers. The role of auction markets is negligible in this market. However, in the distribution channel of sawnwood of domestic

Figure 2. Distribution channels of imported logs (1980)




A : Importers (trading companies)

B : Sawnwood auction markets

C : Wholesalers

D : Retailers

E : Sawnwood distribution centres and others

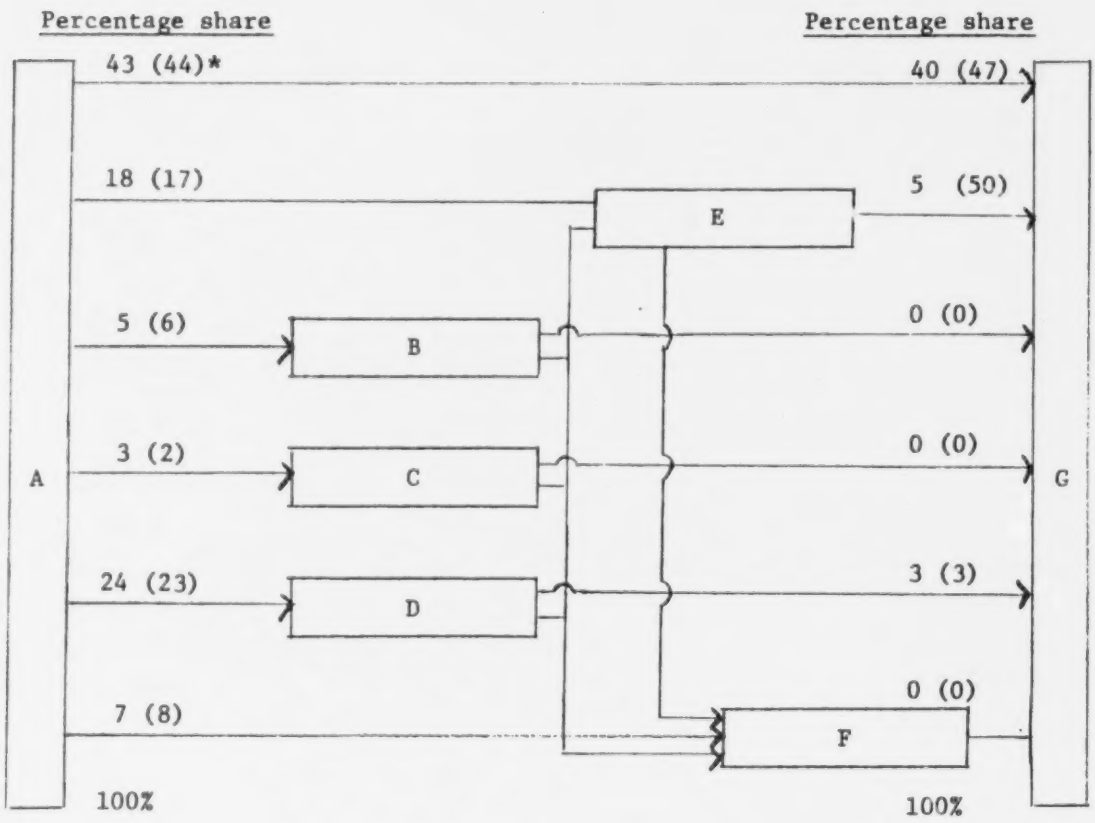
F : Sawmills

G : Plywood mills

* : Figure in parenthesis = 1975 figure

Source: M.A.F.F., Report on Timber Distribution Structure, 1980.

Figure 3. Distribution channels of sawn softwood from imported logs (1980)




A : Sawmills
B : Sawnwood auction markets
C : Sawnwood distribution centres
D : Wholesalers
E : Retailers
F : Others
G : Consumers
* : Figure(s) in parenthesis = 1975 figure(s)

Source: See Figure 2.

softwood species, 20% of total sawnwood from the sawmills flows through auction markets, because the quality and appearance of those products are quite different between one growing area and another.

The distribution channel of plywood in the Japanese market is completely different from that of sawnwood. The main flow of goods from plywood mills is either:

(a) trading companies, which also supply raw materials to plywood manufacturers --> retailers --> consumers, or

(b) wholesalers --> retailers --> consumers.

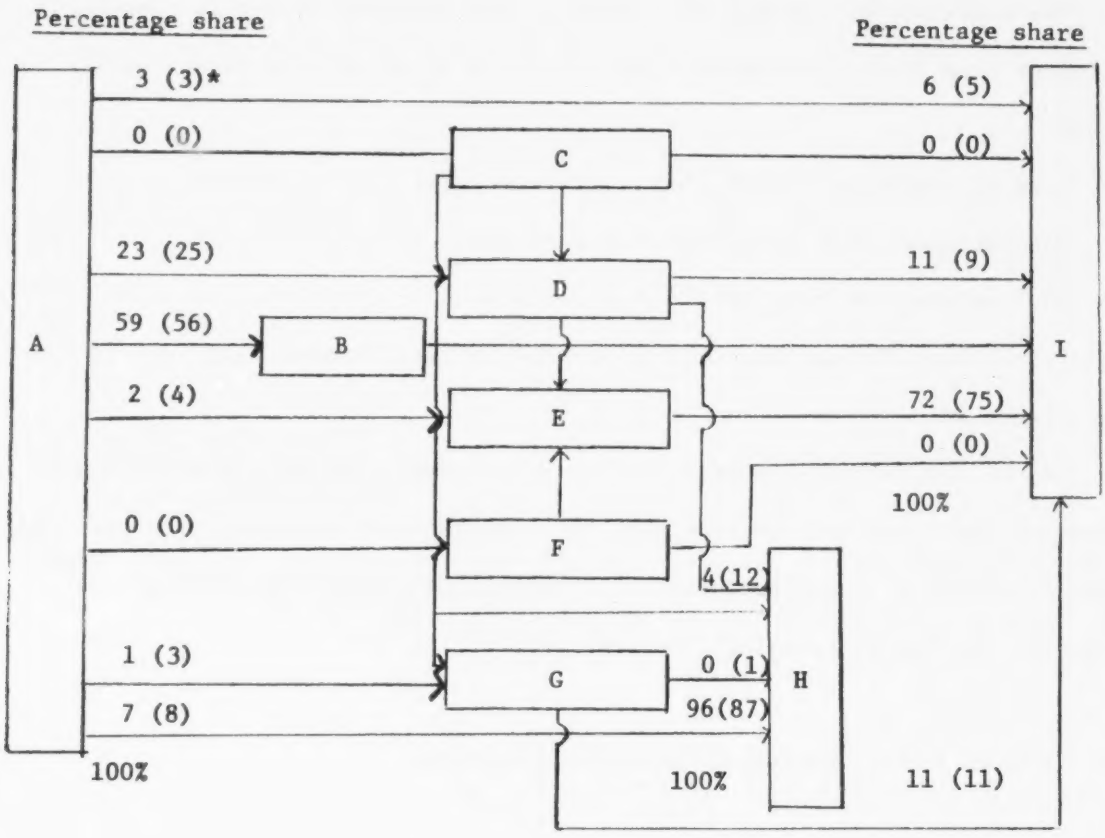
The distribution through auction markets and centers is very rare in this case (see Figure 4).

In the manufacture and distribution of plywood, trading companies have played an important role in supplying raw materials nd marketing products. As shown in Figure 4, the dependence of plywood manufacturers on trading companies has been increasing recently.

## 5.2. Domestic Distribution and Marketing Channels

The distribution system in the Japanese market has been developed in such a way that timber dealers trade in small quantities of various kinds of products between manufacturers and consumers. As a result there are a great number of small traders engaging in distribution of wood and wood products, who generally have a low level of inventory. This structural characteristic tends to amplify short-run price fluctuations of wood and wood products by speculation. In the 1970s, especially after the first oil crisis, wood prices fluctuated drastically in the short run. The main reason for such price fluctuations is that on the demand side wood demand tends to change substantially according to changes in the demand for housing construction,

Figure 4. Distribution channels of regular plywood (1980)




A : Plywood mills

B : Trading companies

C ; Sawnwood auction markets

D : Wholesalers

E : Retailers

F : Sawnwood distribution centres

G : Others

H : Processed plywood mills

I : Consumers

* : Figure(s) in parenthesis = 1975 figure(s)

Source: See Figure 2.

while on the supply side traders cannot adjust themselves quickly to demand fluctuations because of (a) limited availability of domestic logs, (b) time lags in importing logs and (c) uncertainty of the availability of foreign logs.

Furthermore, it is typical of the Japanese plywood industry that manufacturers are heavily dependent on trading companies for their supply of raw materials, marketing products and for financing. Therefore, the Japanese plywood manufacturers do not have enough warehouses for storing their products, although the inventory capacity of plywood mills has been improved for the purpose of stabilizing the domestic plywood market.

Moreover, the function of the sawnwood auction markets as a distributor of a variety of domestic logs could be imporved, since it may be unavoidable for Japan to rely more on domestic wood resources in the long run. It should be noted that the distribution system of domestic logs and sawnwood of domestic species is more complicated than that of imported ones.

## 6. International Trade Structure and Trade Policy in Japan

### 6.1. Pattern of Trade in Wood and Wood Products

In 1981 total value of the Japanese wood exports and imports was US$110 million and US$6,100 million respectively. The Japanese wood-procesing industry has lost its international competitiveness as against the Republic of Korea and the Province of Taiwan since mid-1960s. In recent years wood exports of Japan have been decreasing further due to the continuing sluggish demand for wood products in the main overseas markets such as the United States and Europe. Total wood exports in 1981 declined to only 66 per cent of

the level of 1977, which recorded the highest figure (US$167 million) after the 1973 oil crisis.

The export share by major commodities in 1981 was as follows(by value):

| | |
|---|---|
| Plywood of domestic species | 29 per cent |
| Sawnwood of domestic hardwood species | 22 per cent |
| Lumber-core plywood (blockboard) | 17 per cent |
| Processed plywood | 10 per cent |
| Veneer | 7 per cent |
| Lauan plywood | 4 per cent |
| Others | 11 per cent |
| Total | 100 per cent |

As clearly seen in the above table, plywood exports including veneer acocunt for half of total exports in timber products. One promising export item is lumber-core plywood such as lamina board, block board and batten board. These lumber-core plywood products have been exported mainly to the U.S. market.

Table 18 shows that exports trend of plywood from Japan. In 1981 total exports of plywood were just over 14.2 million $m^2$, composed of 0.7 million $m^2$ of lauan plywood, 9.3 million $m^2$ of regular plywood of domestic species (birch, oak, etc.) and 4.2 million $m^2$ of processed plywood. The main country of destination is the United States, accounting for 78 per cent of total exports in 1981.

Table 18. Exports of plywood

| Year | Export quantity (1,000 $m^2$) | | | | Percentage of export in total production |
|---|---|---|---|---|---|
| | Total | Lauan plywood | Plywood of domestic species | Processed plywood | |
| 1971 | 81,807 | 14,100 | 30,702 | 37,005 | 6.0 |
| 1972 | 67,603 | 2,280 | 33,313 | 32,010 | 4.7 |
| 1973 | 38,857 | 286 | 25,074 | 13,497 | 2.6 |
| 1974 | 30,841 | 209 | 20,590 | 10,042 | 2.2 |
| 1975 | 28,958 | 269 | 20,384 | 8,305 | 2.4 |
| 1976 | 33,448 | 307 | 25,324 | 7,817 | 2.5 |
| 1977 | 34,875 | 608 | 27,592 | 6,675 | 2.7 |
| 1978 | 26,265 | 480 | 21,332 | 4,453 | 1.9 |
| 1979 | 20,205 | 359 | 14,616 | 5,233 | 1.4 |
| 1980 | 13,831 | 565 | 9,748 | 3,517 | 0.7 |
| 1981 | 14,244 | 692 | 9,337 | 4,215 | 0.8 |

Source: Ministry of Finance, Trade Statistics.

In late 1950s Japan's plywood industry used to export about one-third of total production, mainly lauan plywood, to the United States and Europe. As mentioned above, however, the share of plywood from Japan in the overseas markets declined rapidly in the 1960s due to sharp increases in plywood exports from the Philippines, the Republic of Korea, the Province of Taiwan and other developing countries. The export share of plywood production in Japan dropped to around 2 or 3 per cent after 1973 and by 1981 it became almost negligible (0.8 per cent).

Such drastic changes in the world market structure of lauan plywood were attributed to the fundamental change in the cost structure due to the rapid increase in labour cost in the 1960s, when Japan enjoyed high economic growth, causing wage rates to rise sharply. This will be discussed in more detail in the next section.

The current trend of plywood imports to Japan is sown in Table 19. In 1981 the total quantity of plywood was only a little more than 5 million $m^2$, mainly from the United States, Canada, and some Asian developing countries like the Republic of Korea, the People's Republic of China, Malaysia, the Philippines and Indonesia. The share of imported plywood as against domestic production is still negligible (see Table 10).

Plywood imports from the United States and Canada are mainly of softwood species, which are used as housing constructin materials for the so-called '2 x 4' platform framing system prevailing in the United States and Canada. Since this type of housing construction has been more accepted by Japanese customers these days, the plywood imports for this use from the United States and Canada will continue to increase in the future.

Table 19. Imports of plywood by country of origin

($1,000\ m^2$)

| Year | Total | Imports by country of origin | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | U.S. | Canada | Rep. of Korea | Province of Taiwan | Singapore | Malaysia | Philippines | Indonesia | Others |
| 1971 | 14,481 | 153 | 148 | 6,453 | 4,033 | 467 | 8 | 15 | - | 3,204 |
| 1972 | 33,991 | 126 | 132 | 18,150 | 14,559 | 8 | 308 | 257 | - | 451 |
| 1973 | 194,743 | 938 | 196 | 86,028 | 97,729 | 3,804 | 1,962 | 5,027 | - | 1,095 |
| 1974 | 104,914 | 247 | 86 | 54,094 | 45,857 | 2,392 | 233 | 1,005 | - | 1,000 |
| 1975 | 36,910 | 243 | 63 | 24,063 | 11,594 | 68 | 1 | 105 | - | 773 |
| 1976 | 20,879 | 263 | 173 | 18,002 | 1,961 | 5 | - | 1 | - | 454 |
| 1977 | 10,340 | 230 | 80 | 8,066 | 938 | - | 92 | - | - | 934 |
| 1978 | 11,940 | 296 | 98 | 9,132 | 700 | - | 6 | 777 | - | 931 |
| 1979 | 13,358 | 471 | 686 | 9,148 | 907 | 59 | 829 | 362 | - | 896 |
| 1980 | 15,060 | 665 | 2,309 | 7,367 | 382 | - | 1,556 | 51 | 2,600 | 130 |
| 1981 | 5,077 | 504 | 1,706 | 543 | 167 | - | 527 | 17 | 1,595 | 180 |

Source: Ministry of Finance, Trade Statistics.

Some quantity of imports from Indonesia before 1979 is included in "Others".

Table 19 highlights two intriguing points concerning the import performance of the Japnese plywood market:

(1) There are big fluctuations in quantity of plywood imports year by year. In particular, total plywood imports increased nearly six fold from 1972 to 1973 when Japan had an inflationary boom before the oil crisis. Then, in 1975, they were curtailed suddenly up to one-third of the 1974 import level under the worst recession in post-war years. After the second oil crisis in 1979-80 the quantity of plywood imports again dropped sharply to one-third of the previous level.

(2) Similar to the quantity fluctuation of total imports, there are large fluctuations of plywood imports by country of origin; the quantity of imports from the Republic of Korea and the People's Republic of China (mainly the Province of Taiwan) has been decreasing rapidly since 1973. On the contrary, Indonesia has increased her exports to Japan since 1980.

This illustrates the fact that plywood imports to the Japanese market have played a role as a 'safety valve' to adjust domestic demand and supply of plywood. When there is large excess demand for plywood in an inflationary period like in 1972 and 1973, high domestic price of plywood will bring about large quantity of temporary imports from those countries which can provide the required amounts at competititve prices. However, as the domestic market dampens because of recession, similar to 1975 and 1981, the quantity of plywood imports is reduced in the first place because total production capacity of domestic manufacturers is well above that required to fulfil domestic demand for plywood under the present situation of the Japanese economy. It should be admitted that these characteristics of the Japanese plywood imports have brought difficult problems to the plywood-exporting developing countries in Asia.

Turning to the exports of sawnwood of domestic hardwood species, te recent figures are given by Table 20. In 1981 total exports of sawnwood of domestic hardwood species from Japan were about 36 thousand $m^3$, compared to 11 thousand $m^3$ of softwood sawnwood including miscellaneous items. More than 80 per cent of total exports of hardwood sawnwood produced in Japan go to Europe and the Scandinavian countries. Some of the Japanese hardwood sawnwood exported to the Province of Taiwan have been re-exported to the United States and Europe after further processing.

As already shown in Table 7, the import share of sawnwood as against total domestic supply has been increasing steadily in recent years. It exceeded 10 per cent in 1979, including both hardwood and softwood species. The share of sawnwood imports of Japan as against log imports will continue to increase, reflecting the fact that most log-producing countries, developed or developing, have restricted log exports and encouraged the export of more timber in the form of sawn products.

Summarizing the above discussion, Figure 5 may be helpful in providing a better understanding of the pattern of trade in tropical hardwood from Asia:

(1) At present, Indonesia and Malaysia (Sabah and Sarawak) are two major suppliers of tropical hardwood logs in the Asia-Pacific region. On the other hand, major importers of logs are Japan, the Republic of Korea and the Province of Taiwan. Considering that further limitation of log exports from those countries, especially Indonesia and Sabah, import competition of round wood will be more intensified among these countries. While the Japanese imports of tropical hardwood logs are oriented to the domestic market, the wood-processing industries of the Republic of Korea and the Province of Taiwan have been confronted with two-fold difficulties in securing raw materials and competing with log-producing Asian countries in the world market. As a matter of fact, the Indonesian plywood industry

Table 20. Exports of sawnwood of domestic hardwood species

| Year | Total ($m^3$) | Exports by destination / Percentage | | | | |
|---|---|---|---|---|---|---|
| | | Europe[1/] | Scandinavia[2/] | Rep. of Korea | Province of Taiwan | Others |
| 1976 | 50,468 | 77.5 | 14.8 | 2.1 | 0.5 | 5.1 |
| 1977 | 54,330 | 80.5 | 5.5 | 3.1 | 5.0 | 5.9 |
| 1978 | 57,203 | 74.7 | 3.6 | 7.2 | 5.9 | 8.6 |
| 1979 | 54,260 | 68.4 | 6.8 | 10.5 | 8.5 | 5.8 |
| 1980 | 45,685 | 70.0 | 9.3 | 4.8 | 8.2 | 7.7 |
| 1981 | 36,251 | 72.0 | 9.4 | 4.1 | 8.8 | 5.7 |

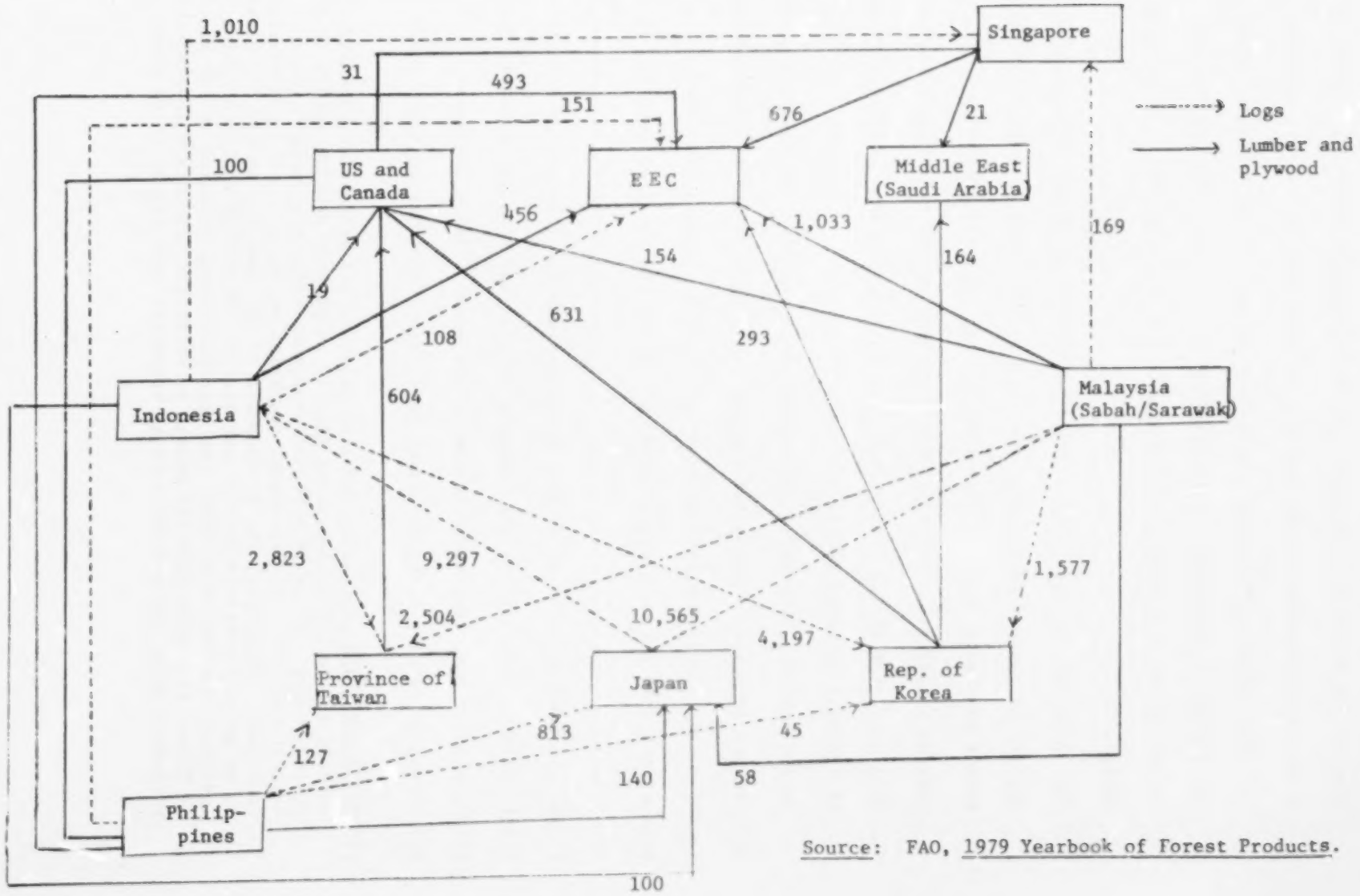
1/ U.K., Belgium, Denmark, Netherlands and West Germany.

2/ Sweden, Norway and Finland

Source: Ministry of Finance, Trade Statistics.

Figure 5. Pattern of trade in tropical hardwood from Asia

(Unit: thousand $m^3$ in 1979)




Source: FAO, 1979 Yearbook of Forest Products.

has set its marketing strategy towards the United States by installing production equipment mainly for 4' x 8' size plywood, widely consumed in the U.S. market. Therefore, Indonesian plywood is in a direct competitive position with that made in the Republic of Korea and the Province of Taiwan in the U.S. market, but not with the Japanese one in the Japanese market.1/

(2) Although the U.S. market still holds a large weight in the world exports of plywood of tropical hardwood species, new markets in Europe and Middle East have recently developed so that diversification and internationalization of the tropical plywood market will step forward. Similarly, the United States and Euope have been a major market for lumber of tropical hardwood species.

On the contrary, the Asian developing countries have not developed Japan as a market in spite of being the largest importer of tropical hardwood logs in the world. There are several reasons for this. First, the Japanese product standard for sawn products may be too severe for the technical level of deveoping countries. Second, most of the plywood marketed in Japan of the 3' x6' size, which is based on the Japanese traditional system of housing construction. In addition, the Japanese plywood industry has recently been maintaining an over-capacity compared to the size of domestic demand. Therefore, it is very risky for Asian developing countries to equip their

1/ The Korean wood-processing industry expanded its production capacity very rapidly in the 1970s, depending heavily on plywood exports mainly to the United States. Since 1979 it has been most badly hit among 'timber deficit countries' by log-export restraint policy of some Asian developing countries. Therefore, the development of the domestic market for plywood is of great importance for the survival of the Korean wood-processing industry. On the other hand, the wood-processing industry in the Province of Taiwan is rather flexible enough to shift its production towards the secondary procesing sectors such as woodworks with higher value added.

factories suitable for producing 3' x 6' size plywood for exportation to Japan. The factories set for producing 4' x 8' size of plywood can produce those of 3' x 6' size as well, but at higher cost, so that the Japanese market is considered to be protected implicitly from this point of view.

6.2. Prices and Shipping Costs.

The general wholesale price index in Japan has shown a rather stable movement over the last decade, except for 1972-74 and 1979-80 (see Table 21). On the contrary, the wholesale price indices of timber, plywood and sawnwood have highlighted the price instability of these products. Although Table 21 should be read with caution because of high aggregation by commodity group, which may cancel out different movements of individual price indices, it clearly points out some salient features of the recent price movement of timber products in Japan.

First, the price movement of domestic logs was more stable than that of imported logs. Among three major species, i.e. U.S. hemlock, Soviet silver fir and lauan logs, making up of imported logs, the price of lauan logs showed big fluctuations. The sharp increase in the price index of domestic logs in 1978-79 and 1979-80 was influenced by a drastic jump in the price of imported logs. Since then, the domestic log price has been on the decrease, accompanied by a drop in the price of imported logs, although the price of lauan logs remains at rather high level.

Second, great caution should be directed to the wholesale index of sawnwood, because it includes both domestic and imported sawnwood. Particularly, imported U.S. hemlock scantlings have hovered around the low price level, while lauan board has stayed at a high price level. In general, just as U.S. hemlock scantlings are a typical case, the price of imported

Table 21. Wholesale price indices of logs, plywood, and sawnwood, 1970-1982 (1975 = 100)

| Year | General price index | Domestic logs | Imported logs | | Plywood | | | Sawnwood |
|---|---|---|---|---|---|---|---|---|
| | | | Average | Lauan | Average | Regular plywood | Processed plywood | |
| 1970 | 63.8 | 61.5 | 69.7 | 76.0 | 87.7 | 90.9 | 85.3 | 64.5 |
| 1971 | 63.3 | 58.5 | 68.5 | 73.9 | 75.0 | 69.3 | 82.0 | 62.8 |
| 1972 | 63.8 | 62.9 | 67.1 | 60.5 | 77.9 | 75.5 | 80.6 | 76.6 |
| 1973 | 73.9 | 87.0 | 100.3 | 92.8 | 127.6 | 139.5 | 115.8 | 108.7 |
| 1974 | 97.1 | 102.8 | 108.2 | 116.4 | 121.3 | 123.4 | 120.7 | 103.0 |
| 1975 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1976 | 105.0 | 104.9 | 118.5 | 138.6 | 112.9 | 118.1 | 106.8 | 111.6 |
| 1977 | 107.0 | 103.4 | 115.5 | 133.4 | 119.9 | 125.4 | 113.3 | 113.6 |
| 1978 | 104.3 | 100.8 | 98.8 | 110.0 | 113.7 | 114.9 | 112.4 | 107.5 |
| 1979 | 111.9 | 118.9 | 160.4 | 209.3 | 156.0 | 167.0 | 144.8 | 140.1 |
| 1980 | 131.8 | 136.2 | 180.9 | 235.2 | 175.7 | 180.3 | 172.6 | 152.3 |
| 1981 | 134.1 | 118.3 | 142.4 | 188.1 | 149.0 | 145.6 | 154.2 | 124.0 |
| 1982 1. (January) | 135.1 | 115.7 | 154.5 | 211.6 | 155.0 | 158.4 | 152.5 | 130.8 |
| 2. (February) | 135.8 | 115.7 | 153.6 | 211.6 | 151.1 | 151.0 | 152.5 | 127.9 |

Source: The Bank of Japan.

sawnwood has remained at a low level during a rather long period, because the quantity of imported sawnwood increases immediately, reacting to even small signs of price improvement.

Third, a large portion in the price fluctuation of plywood can be attributed to changes in the price of lauan logs, since the cost share of raw materials in the production of plywood is very high. The Japanese plywood manufacturers have, first, lost their price competitiveness as against other Asian producers in overseas market, and then, they have begun to lose their competitive power to other wood-based panels such as particle board and fibreboard, and non-wooden panels like plaster board in the domestic market.

In illustration of the former case, a comparison of the cost structure between Japan and Republic of Korea is given as follows:

Table 22. Standard cost structure of regular plywood

| | Japan (1979) (3' x 6', 12 mm) | Republic of Korea (1979) (4' x 8', 12 mm*) |
|---|---|---|
| Timber | 65.0 | 81.0 |
| Adhesives | 10.3 | |
| Labour | 14.1 | 7.3 |
| Other expenses | 10.6 | 11.7 |
| (Electric power) | n.a. | (1.6) |
| (Water and light) | n.a. | (1.5) |
| (Depreciation) | n.a. | (1.4) |
| Total | 100.0 | 100.0 |

Source: Forestry Agency, M.A.F.F., Japan, quoted from Sigesawa, S. (1980), op. cit, p. 24.
Lee, D-H et al. (1981), Comparative Advantage of Electronics and Wood-processing Industries in Korea, IDE, Tokyo, p.50.
*Thickness assumed by author.

As clearly seen in Table 22, the labour cost in Japan is about twice as high as that in the Republic of Korea. As already discussed in Chapter 4.2., the relatively high labour cost of plywood production made Japanese manufacturers less competitive in overseas markets, especially in the U.S. Market in the 1960s.

The price of lauan logs has stayed at a high level since it increased by more than 130 per cent over the two years 1978-80. During the same period the average price of plywood rose by 55 per cent; this clearly made plywood more expensive than other wooden and non-wooden panels on the domestic market. Apart from unfavourable market conditions due to the lasting economic recession, substitution of other industrial materials for plywood, which has been under way recently, is one of the major problems facing the Japanese plywood industry.

When one consideres the international price competitiveness in wood and wood products, the shipping costs should be taken into account. The shipping costs from major log-exporting countries in Asia and the Pacific to Japan are given in Table 23.

Table 23. Freight costs of wood and wood products to Japan (February 1983)

| | Country of origin | | Flag regulation |
|---|---|---|---|
| Logs | Sabah | \$14 per $m^3$ | free |
| | Sarawak | \$15 per $m^3$ | free |
| | Indonesia | \$21 - 22 per $m^3$ | 50/50 |
| | Papua New Guinea | \$26 per $m^3$ | Free |
| Plywood/ sawnwood | Indonesia | \$33 per $m^3$ (liner basis) | 100 per cent |
| Wood products | Indonesia | \$40 per $m^3$ (liner basis) | 100 per cent |

Source: Based on the author's interview with industry experts.

The freight price given in Table. 23 may be cheaper by 30 or 40 per cent than the peak price. According to the Forestry Agency, the freight price of logs from Kalimantan (Indonesia) to Japan was $31 per $m^3$ in February 1981.

Based on the freight costs given in Table 23, one can calculate the share of shipping costs to C.I.F. prices of wood and wood poducts. As an illustration consider the following case:

Wholesale price[1/] of lauan plywood = 1,500 Yn /sheet in Japan (90 x 180 cm, 12 mm). Since 1 sheet ( 90 x 180 cm, 12 mm) is equivalent to 0.01944$m^3$, the wholesale price of lauan plywood in Japan is 77,160 Yen/$m^3$, which corresponds to about US$335 at the exchange of 230 Yen/Dollar. Therefore, the shipping cost from Indonesia to Japan accounts for about 10 per cent of the wholesale price in this case.

According to the author's interview with industry experts, the share of shipping cost to C.I.F. price of lauan plywood amounts to about 12 - 13 per cent[2/] (Indonesia to Japan), about 14 - 15 per cent (Indonesia to United States), about 18-19 per cent (Indonesia to Europe) as of February 1983.[3/] Taking into account the escalating structure of tariffs, the difference between F.O.B. price and wholesale price of the same product is considered to be fairly large. Tariff problems will be discussed in more detail in the next section.

## 6.3. Trade Barriers vis-a-vis Developing Countries

Table 24 shows the Japanese tariff schedule of major wood and wood products as of 1982. There are four kinds of import duties: the basic rate, the conventional rate, the provisional rate and the preferential rate. The

1/ Since C.I.F. price is not available, wholesale price is used here.
2/ 15 per cent at peak time.
3/ On liner basis; the freight price on charter basis is usually cheaper by 30-40% than that on liner basis.

preferential rate is given with the first priority to the products imported from the preference beneficiary countries and regions. This rate applies to not only all log-exporting developing countries in Asia and the Pacific, but also newly industrializing countries in Asia such as the Republic of Korea, the Province of Taiwan, Hong Kong and Singapore. Apart from the preferential rate, the conventional rate is first applied, followed by the provisional rate and then, the basic rate.

As shown in Table 24, the Japanese tariff schedule of wood and wood products clearly demonstrates the tariff escalating structure: the tariff rates are higher with higher degree of raw materials processing. Except for kiri species (paulownia), all round logs are imported free of duty to Japan, while 5 - 30 per cent of the basic tariff rates are imposed on wood products according to the kind of wood species and commodity items.[1/]

In order to facilitate industrialization and manufactured exports of developing countries, the preferential tariffs of Japan are basically set at zero, except for several selected products. First, the preferential tariffs

1/ This implies that since the cost of round logs usually accounts for 60-70% of the price of plywood, 20% nominal tariff rate on imported plywood is equivalent to over 60% effective protective rate, assuming that all other inputs are domestically produced.
This calculation is based on the following formula:

$$g_j = \frac{t_j - \sum_i a_{ij} t_i}{1 - \sum_i a_{ij}}$$

where $g_j$: effective protective rate on product j.
$t_j$: nominal tariff rate on project j.
$t_i$: nominal tariff rate on input i.
$a_{ij}$: share of input i in productin cost per unit of product j.
In the above examples nominal tariff rate on round logs for plywood is zero.
See Corden, W.M. (1971) The Theory of Protection, Chapter 3. Oxford University Press.

Table 24. Tariff schedule for wood and wood products in Japan (1982)

| Item | Tariff rates (A) | (B) | (C) | (D) | Tokyo Round Agreement MTN (E) | (F) |
|---|---|---|---|---|---|---|
| | % | % | % | % | % | |
| A. Logs | | | | | | |
| Kiri; paulownia | 5 | - | - | 0 | - | - |
| Others | 0 | - | - | - | - | - |
| B. Sawnwood | | | | | | |
| Mataui, pine, fir and spruce) thickness less than 16 cm | 10 | 20 | - | 0 | 6 | 1984-87 |
| Mataui, pine, fir and spruce) thickness over 16 cm | 0 | - | - | - | - | - |
| Larch (thickness less than 16 cm) | 10 | - | - | 0 | - | - |
| Larch (thickness over 16 cm) | 0 | - | - | - | - | - |
| Lauan | 10 | - | - | *(0) 50 | - | - |
| Kiri | 5 | 25 | 25 | 0 | - | - |
| Others | 0 | - | - | - | - | - |
| C. Processed wood | | | | | | |
| Pine, fir, spruce and larch (thickness less than 16 cm) | 10 | - | - | 0 | - | - |
| Lauan | 10 | - | - | 0 | - | - |
| Kiri | 5 | 25 | 25 | 0 | - | - |
| Others | 0 | - | - | - | - | - |
| D. Wood products | | | | | | |
| Wooden bar | 15 | 59 | - | 0 | 5 | 1980-87 |
| Veneer | 15 | 150 | - | *(0) 7.5 | - | - |
| Lamina ( red sandal, etc.) | 20 | 106 | 150 | 0 | 1 | 1980-87 |
| Lamina ( Incense cedar) | 15 | - | 0 | - | - | - |
| Lamina ( teak) | 15 | 0 | - | 0 | - | - |
| Lamina ( kiri, etc.) | 15 | - | - | 0 | - | - |
| Glued laminated wood, block board etc. | 20 | - | - | 0 | - | - |
| Ply-wood (( softwood) | 20 | 150 | 150 | - | - | - |
| Ply-wood (( processed) | 20 | 188 | - | - | 15 | 1984-87 |
| Ply-wood ( Others (thickness less than 6 mm) | 20 | 200 | - | - | - | - |
| Ply-wood ( Others (thickness over 6 mm) | 20 | 193 | - | - | 17 | 1984-87 |
| Improved wood | 15 | 100 | - | 0 | 7 | 1980-87 |
| Reconstituted wood (particle board) (board) | 20 | 131 | 150 | 0 | 12 | 1980-87 |
| Reconstituted wood (particle board) (others) | 15 | 119 | - | 0 | 10 | 1980-87 |

Table 24. (continued)

| Item | | Tariff rates (A) | (B) | (C) | (D) | Tokyo Round Agreement MTN (E) | (F) |
|---|---|---|---|---|---|---|---|
| E. Furniture | | % | % | % | % | % | |
| Chair, stool and parts | (leather over-lay) | 25 | 6.4 | 8.0 | 0 | - | - |
| | (ratten) | 30 | 5.8 | 6.0 | 0 | - | - |
| | (others) | 20 | 6.0 | 8.0 | 0 | - | - |
| Other furniture and parts | (real sandal, boxwood, Indian ironwood, ebony) | 30 | 6.6 | 8.0 | 0 | - | - |
| | (ratten) | 30 | 5.8 | 6.0 | 0 | - | - |
| | (Others - wooden or metal) | 20 | 6.0 | 8.0 | 0 | - | - |

(A) Basic rate

(B) Conventional rate

(C) Provisional rate

(D) Preferential rate

(E) Final rate

(F) Period

*( ) Applies only to LDCs

Source: M.I.T.I., Current Import System, 1982.

imposed on lauan sawnwood and veneer are not free of duty, but half of the basic rates, apart from the case of least developed countries (LDCs). Second, plywood is exluded from the import items which are given preferential treatment in Japan. Third, the following import items which are given preferential treatment as duty-free goods, are exposed to the limits of ceiling in one way or another: logs of kiri species, sawn and further processed wood of kiri species, lauan sawnwood, veneer, lamina, glued laminated wood and block board, particle board and fibreboard for construction use, transom, other processed sawnwood, and cork and cork products. Consequently, it must be admitted that the preferential scheme of Japan is not favourable to developing countries from the standpoint of their interests in promoting exports of wood products.

From the Japanese point of view, it is interesting to consider the effects of liberalizing trade in wood products. Needless to say, it is very difficult to analyze the quantitative effects of lowering or eliminating tariffs for both methodological and empirical reasons.1/

However, there are three general points to be made in this matter. First, according to the previous studies carried out in connection with the Tokyo Round multilateral trade negotiation, the quantitative effects of lowering tariffs are usually very small compared with total imports. Second, taking acocunt the importance of non-price competitiveness, the real effects of increasing imports caused by a tariff reduction may be much smaller than expected. Third, the positive impacts of liberalizing trade should be evaluated more properly on the part of the importing country; trade liberalization will bring about more efficient use of domestic resources. In the long run more restrictive trade policy may end up with making import-competing industries less and less competitive.

1/ For example, see Cline, W.R. et al. (1978), Trade Negotiations in the Tokyo Round: A Quantitative Assessment, the Brookings Institution, Washington D.C.

As already discussed in the previous chapters, some of the difficulties facing wood-processing industries in Japan originated from domestic problems. Therefore, it will be ineffective and perhaps harmful to depend excessively on trade policy as a means of coping with those problems.

## 7. Adjustment Assistance to Wood-processing Industry in Japan

### 7.1. Adjustment Problems of Wood-processing Industry

The detailed discussions in previous chapters clearly revealed that the Japanese wood-processing industry - i.e. the primary processing sector - have been confronted with a number of adjustment problems in recent years. It may be helpful to enumerate these problems in order to summarize the discussions made so far:

(1) Prolonged depression of the housing market (chapter 2);

(2) Import constraints on "South Sea" logs (chapter 3.1.);

(3) Structural problems of the primary processing sectors (chapter 4);

(4) Domestic competition among wood products and between wood and non-wood (or mixed) products in the same areas of end-use (chapter 3.2. and chapter 4);

(5) Domestic distribution and marketing problems (chapter 5);

(6) Competition with wood products from some Asian developing countries as well as some developed countries (chapter 6).

What makes the situation worse is that the problems mentioned above are interwoven with each other so that piece-meal adjustment policies presumably make it difficult to tackle them. Furthermore, it should be noted that some

of the problems are basically regarded as inherent, domestic problems of the Japanese wood-processing industry, while others are caused by factors external to the Japanese economy. There is some room for improving the current situation through international co-operation between 'timber deficit' and 'timber surplus' countries.

As for (1) the wood-processing industry cannot exert any positive influence on the housing sector, whereas the opposite holds true. According to the latest information available[1/], the real recovery of the housing sector from its worst recession is unlikely to come in 1983, although the beginning of this year shows an improvement of housing construction compared to the same period of last year.

Since there is little scope for a substantial increase in demand for plywood, all the plywood industry can do is to reduce its production capacity to the level which is required to meet the long-term level of demand. This is also related to (3).

Second, with reference to (5), it is very crucial to take price and demand stabilization measures not only from domestic point of view, but also from internatinal point of view. Excessive fluctuations in price and demand on the domestic market discourage any efforts of domestic producers to rationalize their production capacity and gives misleading signals to foreign producers.

Third, in connection with (2) and (6), the trade policy of Japan, which is quite protectionistic concerning the wood-processing industry, should be reconsidered in order to build up better relationships between Japan and log-exporting Asian countries. It is perhaps harmful even to domestic producers in the long run.

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1/ Nikon Keizai Shinbun (Japan Economic Journal), 9 March 1983.

Last, it is important to direct much effort to technological development for more efficient use of "commercially-less-acceptable species" and development of new products to match the future changes in market structure and preferences (4).

## 7.2. Characteristic of Adjustment Assistance to Wood-processing Industry

The basic attitude of government toward adjustment assistance to the wood-processing industry is to encourage self-help efforts of private enterprises. The following policies adopted by government are most important as adjustment assistance to the wood-processing industry:

(1) Urgent countermeasure project for the re-organization of the wood-processing industry (1982-83)

- sawmilling.
- plywood.

Government supports the industry associations concerned to encourage the scrapping of equipment, which is considered excess-capacity, by partially financing the interest of private bank loans which is used as the project fund and managed by the industry associations.

(2) Provisional law for business transformation of small-and medium-scale enterprises (1976-86)

- sawmilling (1977 onward)
- plywood (1977 onward)
- woodchips (1980 onward)

Government supports small- and medium-scale enterprises to restructure their business to move into other lines of production which are badly hit for 'structural' reasons, by providing indirect subsidies, tax reduction and so on.

(3) Law for modernization and promotion of small- and medium-scale enterprises (1963 onward)

- sawmilling
- plywood
- glued laminated timber.

Government helps small- and medium-scale enterprises to exert their modernization and rationalization programmes through financial support and tax reduction.

(4) Employment insurance law (1974 onward)

- sawmilling (1977-83)
- plywood (1977-83)
- veneer (1981-82)
- particle board (1981-82)
- woodchips (1978-84), etc.

Government helps enterprises belonging to the designated industries to pay wages to the employees, who are laid off or re-trained, by financing half of their expenses (or two-thirds in the case of small- and medium-scale enterprises).

(5) Provisional law for unemployed in the depressed industry (1977-1983)

- plywood (1978-1983)
- glued laminated timber (1978-1983).

This law enables the unemployed in the designated industry to obtain their unemployment benefits for a longer period than usual.

(6) Japan Timber Products Storage Organization (1974)

This organization was set up in 1974 under the Ministry of Agriculture, Forestry and Fishery. In order to stabilize the price level of sawnwood and plywood this organization adopts the buffer stock policy which supplies, for example, plywood stock to the market in high-price period. In 1979, this

buffer stock policy was enforced twice to calm down the plywood market when the price of plywood soared together with the import price of "South Sea" logs, and proved to work well for price stabilization.[1/]

Government adjustment assistance to the wood-processing industry consists of a variety of measures, some of which seem to be overlapping. Therefore, the transparency of adjustment policies is not so clear and the real effects of these policies cannot be easily gauged.

The attempt to stabilize price fluctuation by Japan Timber Products Storage Organization is quite unique. It is expected that its function will be strengthened (stocking 130 thousand $m^3$ of sawnwood and 7.2 million sheets of plywood (converted into 2.5 mm thickness) as of 1981.

## 8. Aspects of International Co-operation between 'Timber Deficit' and 'Timber Surplus' Countries

Among six items of adjustment problems, which were listed in chapter 7.1., domestic adjustment assistance measures directed to the wood-processing industry mainly deal with problems (3) and (5) by partial scrapping of production equipment to reduce over-capacity and buffer stock policy for price stabilization. In order to cope with problems (2) and (6), there is much scope for international co-operation between 'timber deficit' and 'timber surplus' countries.

The various methods of international co-operation between Japan and developing countries in Asia and the Pacific include inter alia:

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1/ 240 thousand sheets of concrete-form plywood of 12 mm thickness at the end of January 1979, and 250 thousand sheets of concrete-form plywood of 12 mm thickness and regular plywood of 2.5 mm thickness at the end of June 1979 were made available from the stockpile.

(a) direct foreign investment/joint venture.

(b) international sub-contracting.

(c) technical co-operation.

Log-exporting developing countries in Asia and the Pacific wish to (a) create higher value added, (b) increase foreign exchange earnings, (c) provide more employment opportunities, and (d) contribute to regional development through promotion of local processing of round wood. It is therefore important to examine what could be done to create a more stable relationship between 'timber deficit' and 'timber surplus' countries through various types of international co-operation.

## 8.1. Direct Foreign Investment/Joint Venture

International co-operation through direct foreign investment in the form of joint venture has come to a turning point, because the forest business itself has become highly risky under the depressed market conditions and further because some developing countries have drastically changed their log-export policies in recent years.

P.T. Kutai Timber Indonesia (KTI) is one of the 'exceptionally' successful cases in the field of forest management and plywood manufacturing (see Table 25). As shown in Tables 26 and 27, the number of plywood mills and the volume of production capacity have been increasing dramatically since 1979. This caused a number of difficulties in terms of securing supply of raw materials and marketing of products. As a result, the wood-processing industry in Indonesia has become risky from the Japanese counterparts' point of view.

On the other hand, there is an interesting case of joint venture project between Japan and Thailand in Trang, Southern Thailand. This joint-venture

Table 25. P.T. Kutai Timber Indonesia (short history)

| | | |
|---|---|---|
| 1969 | December | Sumitomo Forestry Ltd., Japan established a joint venture, P.T. Kutai Timber Indonesia (KTI) with local firm, P.T. Kaltimex Djaya in East Kalimantan. |
| 1970 | | Started logging. |
| 1974 | | Constructed a plywood mill in East Java. |
| 1975 | January | Started operation.<br>Production capacity: 300 thousand sheet (4' x 8' size), or 7,000 $m^3$ per month. |
| 1979 | | Started plywood export to European countries. |
| 1980 | | Increased production capacity:<br>600 thousand sheet or 14,000 $m^3$ per month.<br>Full operation with three shifts a day.<br>Timber consumption: 180 thousand $m^3$ per year (only 60 thousand $m^3$ supplied by KTI forest district).<br>Employees: 2,000 persons (at peak time). |
| 1981 | March | Share holding: Indonesia 51%<br>Japan 49%<br><br>(at first it was Indonesia 30%, and Japan 70%) |
| 1983 | February | Local employees: 1,500 persons.<br>Japanese staff: 17 persons. |

Source: Based on the author's interview.

Table 26. Number of plywood mills and production capacity in Indonesia

| Year | Number of mills | Production capacity*(thousand $m^3$) |
|---|---|---|
| 1973 | 2 | 28 |
| 1974 | 5 | 103 |
| 1975 | 8 | 305 |
| 1976 | 14 | 405 |
| 1977 | 17 | 535 |
| 1978 | 19 | 799 |
| 1979 | 21 | 1,089 |
| 1980 | 29 | 1,949 |
| 1981 | 40 | 3,150 |
| 1982 | 58 | 3,490 |

* Based on two shifts a day.

Source: Nikkan Mokuzai Shinbun (Daily Timber Journal), 2 February 1983.

Table 27. Regional distribution of plywood mills in Indonesia

| Region | Number of mills | |
|---|---|---|
| | Operating | Under construction |
| Sumatra | | |
| North Sumatra | 6 | 1 |
| West Sumatra | 5 | 3 |
| South Sumatra | 10 | 3 |
| Sub-total | 21 | 7 |
| Java | 5 | - |
| Kalimantan | | |
| West Kalimantan | 10 | 5 |
| Central Kalimantan | 3 | 8 |
| South Kalimantan | 7 | 6 |
| East Kalimantan | 10 | 12 |
| Sub-total | 30 | 31 |
| Sulawesi/others | 2 | 10 |
| Total | 58 | 48 |

Source: See Table 25.

project produces furniture parts from rubberwood wastes and exports them to Japan. The project can be profitable, because utilization of rubberwood has a very stron cost advantage over domestic timber in Japan such as beech and birch, and because the supply of raw materials and marketing semi-finished products are secured.

As illustrated above, the secure supply of raw materials at reasonable prices as well as marketing arrangement of wood products are prerequisites for international co-operation in the form of direct foreign investment/joint ventures.

## 8.2. International Sub-contracting

Table 28 shows key-aspects of an international sub-contracting agreement between a Burmese and Japanese furniture factory. This is a good example of international sub-contracting in which the Japanese firm provides production equipment and technical assistance to a Rangoon furniture factory, while the Burmese firm supplies raw materials (teak wood) required to produce furniture and parts thereof. This factory is 100% owned by the Government of Burma. On the Japanese side the project was financed by supplier's credit from the Export-Import Bank of Japan.

This project has an element of technical assistance. At the initial stage, six Burmese personnel were sent to Japan for six months for the purpose of language and technical training. Concomittantly, six Japanese engineers were sent to Burma to help set up the factory and train Burmese personnel.

The marketing arrangement between the two enterprises comprises export of semi-finished products to Japan. This type of international co-operation thus merits suport and promotion, because problems related to marketing of products can be avoided beforehand.

Table 28. Outline of the Rangoon Project (as of January 1983)

1. Factory size:
   Main factory: 2,600 m
   Dry Kiln, boiler and sawnmill: 900 $m^2$

2. Consumption of wood material: 3,080 $m^3$

3. Number of workers: 230 persons

4. Yearly production and products:

| | | | |
|---|---|---|---|
| Living chair set | : | 4,000 sets | 690 ton |
| Dining set | : | 6,000 sets | 790 ton |
| Outdoor set | : | 3,000 sets | 600 ton |
| Furniture parts | : | - | 1,000 ton |

5. Estimated yearly turnover (final) : US$1.8 million (approximately).

6. Schedule for production capacity:

| | |
|---|---|
| 40% by March | 1983 |
| 50% by September | 1983 |
| 75% by March | 1984 |
| 100% by March | 1985 |

Source: Based on the author's interview.

## 8.3. Technical Co-operation

Apart from technical co-operation by private firms of Japan, the following analysis is provided on two technical co-operation projects which have recently been carried out through government assistance:

(a) Technical co-operation project for the technological development of particle board in the Philippines (1977-82).

A pilot particle board plant was set up by providing production equipment from Japan. During the period 1977-1982, 20 Philippino personnel were sent to Japan to receive technical training while 27 Japanese technicians were sent to the Philippines to assist in the establishment of the pilot plant.

The primary objective of the project is: to construct a pilot plant; to transfer production technology of particle board manufacturing; and to train personnel. The pilot plant is now ready for continuous production operation. It was confronted with a number of difficulties such as (1) inadequate utilities, i.e. water and electricity, (2) difficulty in the recruitment of qualified personnel, and (3) delay in construction due to long bidding procedures.

(b) Technical co-operation project for the development of building materials in Indonesia (1977-1983)

The main objective of this project is to set up a pilot pulp plant as well as a pilot plant of pulp cement board (P.C.B.) for the purpose of more efficient use of wood wastes, and a pilot plant of artificial light weight aggregate (A.L.A.), both of wich are expected to produce construction materials for low-cost housing in Indonesia. Due to a long delay in the construction of buildings and infrastructure, the implementation of this project is behind schedule.

Since 1978, Indonesia has sent 14 personnel to Japan, including 10 trainees of P.C.B., Pulp and A.L.A., while Japan has sent 19 technicians to Indonesia. However, it is still necessary to continue counterpart training in Japan for the purpose of advanced training in each area of P.C.B., Pulp and A.L.A.

With these two examples show some of the difficulties of implementing technical co-operation projects, this type of international co-operation should be seriously evaluated and considered with a view to improving relationships between 'timber deficit' and 'timber surplus' countries.

## 9. Conclusions

The major conclusions and policy recommendations emanating from this study are:

(1) The Japanese primary wood-processing industry has encountered a number of adjustment problems since early 1970s. On the demand side some of these problems are rooted in the inherent domestic problems of Japan, mainly due to declining demand for housing construction, while on the supply side increasing difficulties in obtaining logs have contributed to the current problems facing the industry.

(2) In recent years various types of government assistance have been directed towards the wood-procesing industry to reduce over-capacity and stabilize price fluctuations in the domestic market, which will improve the current situation to some extent.

(3) There is much scope for improving economic relations with log-exporting developing countries in Asia and the Pacific by means of changes in trade policy and by strengthening international

co-operation in regard to direct foreign investment/joint ventures; international subcontracting; and technical co-operation.

(4) Given the current depressing conditions in the primary wood-processing sector in Japan, it is unlikely that imports of these products will increase rapidly in the near future. However, because of their comparative advantages in producing primary wood products there exist a long-run potential for timber surplus developing countries to increase their exports to Japan.

(5) The absence of tariff barriers for secondary wood products presents opportunities for the developing countries in the region. In order to exploit these opportunities the developing countries need to strengthen their secondary wood-processing sector.

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Annex

## List of Institutions and Associations Related to the Wood Processing Industry in Japan

- Forestry and Forest Products Research Institute
  P.O. Box 2
  Ushiku
  Ibaraki 300-12
  Japan

- Japan Lumber Importers Association
  Yushi-Kogyo Building
  No. 13-11, Nihonbashi, 3-chome
  Chuo-ku
  Tokyo 103
  Japan

- Japan Plywood Manufacturers Association
  Meisan Building
  No. 18-17, Nishi-Shinbashi, 1-chome
  Minato-ku
  Tokyo 105
  Japan

- Japan Woodworking Machinery Association
  Kikai-Shinko Building
  3-5-8, Shiba-koen
  Minato-ku
  Tokyo 105
  Japan